

Hunters Point Naval Shipyard, Parcel G, RSY Data Report

Contract No. N62473-17-D-006 CTO N6247318F5065 RSY Pad Data Report									
RSY Pad: RSY 28 Use 1					Soil Origin: Former Building Sites 317, 364, and 365 SU28C				
Data attached and submitted by: Amy Mangel					Data Report Submittal Date: 02/17/2021				

Systematic Soil Sample Data: RSY 28 Use 1										
Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 Nal Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	⁹⁰ Sr Final Analytical Results (pCi/g)	²³⁵ U Final Analytical Results (pCi/g)	²³⁹ Pu Final Analytical Results (pCi/g)	
Project Remediation Goals*										
HPPG-317364365-SU28C-001	1	Systematic	9,437	15,658	-0.00645	-0.00666	0.0775	0.0172	-0.00193	
HPPG-317364365-SU28C-002	2	Systematic	10,057	15,658	0.364	0.0403	N/A	N/A	N/A	
HPPG-317364365-SU28C-003	3	Systematic	9,308	15,658	0.194	0.0177	N/A	N/A	N/A	
HPPG-317364365-SU28C-004	4	Systematic	9,366	15,658	0.344	-0.0237	N/A	N/A	N/A	
HPPG-317364365-SU28C-005	5	Systematic	9,787	15,658	0.336	0.00411	N/A	N/A	N/A	
HPPG-317364365-SU28C-006	6	Systematic	9,881	15,658	0.444	-0.00561	N/A	N/A	N/A	
HPPG-317364365-SU28C-007	7	Systematic	9,409	15,658	0.285	-0.0251	N/A	N/A	N/A	
HPPG-317364365-SU28C-008	8	Systematic	9,612	15,658	0.413	0.0311	N/A	N/A	N/A	
HPPG-317364365-SU28C-009	9	Systematic	8,838	15,658	0.314	0.0138	N/A	N/A	N/A	
HPPG-317364365-SU28C-010	10	Systematic	9,792	15,658	0.262	0.00663	N/A	N/A	N/A	
HPPG-317364365-SU28C-011	11	Systematic	9,784	15,658	0.108	-0.00376	0.0220	0.0316	-0.00571	
HPPG-317364365-SU28C-012	12	Systematic	9,664	15,658	0.241	0.0282	N/A	0.0214	-0.0115	
HPPG-317364365-SU28C-013	13	Systematic	9,374	15,658	0.179	-0.0207	N/A	N/A	N/A	
HPPG-317364365-SU28C-014	14	Systematic	9,488	15,658	0.251	0.0184	N/A	N/A	N/A	
HPPG-317364365-SU28C-015	15	Systematic	9,584	15,658	0.276	-0.0487	N/A	N/A	N/A	
HPPG-317364365-SU28C-016	16	Systematic	9,641	15,658	0.242	0.000152	N/A	N/A	N/A	
HPPG-317364365-SU28C-017	17	Systematic	8,634	15,658	0.367	0.00133	N/A	N/A	N/A	
HPPG-317364365-SU28C-018	18	Systematic	8,936	15,658	0.291	0.0167	N/A	N/A	N/A	
HPPG-317364365-SU28C-019	19	Systematic	9,050	15,658	0.269	0.0133	N/A	N/A	N/A	
HPPG-317364365-SU28C-020	20	Systematic	9,893	15,658	0.261	0.0222	N/A	N/A	N/A	
HPPG-317364365-SU28C-021	21	Systematic	9,177	15,658	0.158	0.0242	0.194	0.0123	-0.00206	
HPPG-317364365-SU28C-022	22	Systematic	9,161	15,658	0.330	0.00385	N/A	N/A	N/A	
HPPG-317364365-SU28C-023	23	Systematic	9,798	15,658	0.279	0.0270	N/A	N/A	N/A	
HPPG-317364365-SU28C-024	24	Systematic	10,211	15,658	0.342	0.0181	N/A	N/A	N/A	
HPPG-317364365-SU28C-025	25	Systematic	9,166	15,658	0.289	0.00116	N/A	N/A	N/A	
Soil Systematic Sample Statistics					²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	⁹⁰ Sr Final Analytical Results (pCi/g)	²³⁵ U Final Analytical Results (pCi/g)	²³⁹ Pu Final Analytical Results (pCi/g)	
					Maximum	0.444	0.0403	0.194	0.0316	-0.0019
					Mean	0.2733	0.0062	0.0978	0.0206	-0.0053
					Median	0.279	0.0066	0.0775	0.0193	-0.0039
					Minimum	-0.00640	-0.0487	0.022	0.0123	-0.0115
					Standard Deviation	0.0961	0.0204	N/A	N/A	N/A

Biased Soil Sample Data: RSY 28 Use 1									
Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 Nal Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	⁹⁰ Sr Final Analytical Results (pCi/g)	²³⁵ U Final Analytical Results (pCi/g)	²³⁹ Pu Final Analytical Results (pCi/g)
Project Remediation Goals*									
HPPG-317364365-SU28C-B-001	1	Biased	10,398	15,359	0.458	-0.00127	-0.0237	0.0235	0.00196

CPM Counts per minute

pCi/g Picocuries per gram

* Note: Project Remediation goal (RG) is the Record of Decision RG or Offsite RBA value, whichever is higher

Instrument and Survey Summary					
Activity	Survey #	Date	Meter	Calibration Due Date	Serial #
Gamma Walkover Survey	HPRS-11202020-PG-ROV-328	11/20/2020	RS-700	03/31/2022	5447/5448
Follow-Up Static Survey	HPRS-11232020-PG-JSS-336	11/23/2020	RS-700	03/31/2022	5447/5448
Systematic Sample Survey	HPRS-11232020-PG-JSS-340	11/23/2020	3x3	08/06/2021	108853
Biased Sample Survey	HPRS-11242020-PG-JSS-344	11/24/2020	3x3	10/09/2021	271420

Region of Interest (ROI) Summary	
ROI	Nuclide and Energy
ROI 3	Ra-226 (1764 keV)
ROI 6	Ra-226 (609 keV)
ROI 7	Cs-137 (662 keV)
ROI 8	Ra-226 (351 keV)
ROI 10	Gross Gamma

Summary: RSY 28 Use 1
1) Gamma walkover survey and data review—upon review of initial RS-700 scan data in accordance with Final Parcel G Work Plan Section 3.5.1.1, 26 follow-up static investigations were required. Gamma scan data summary statistics, normal Q-Q plots, histograms, and box plots are provided on pages 3-6. Contour maps of the scan data for the ROIs of interest are presented on page 7. The RSY scan data was lower than the background scan data. The exact same RS-700 and detectors were used for the background data collection and the RSY pad data collection. Note: This pad was partially full which is why there is a lower number of scan data points.
2) One-minute static follow-up measurements with the RS-700 were collected at 26 gamma walkover investigation locations in accordance with Final Parcel G Work Plan Section 3.3.1. A map of the follow-up locations is presented on page 9. The net follow-up static spectra are presented on pages 14-39. The exact same RS-700 and detectors were used for the background data collection and the RSY pad data collection.
3) In accordance with Final Parcel G Work Plan Section 3.4.1, twenty-five systematic soil samples (001-025) were obtained and submitted for gamma spectroscopy analysis. Sample locations are shown on the Systematic Sample Survey map (page 10). TestAmerica sample results are attached (pages 40-80). Ten percent of the systematic soil samples (three samples in total -001, -011, & -021) were also analyzed for strontium-90, uranium-235, and plutonium-239. Strontium-90, uranium-235, and plutonium-239 results are also included in the TestAmerica sample results report (pages 40-80). Systematic sample -012 was erroneously requested by APTIM for uranium and plutonium alpha spectroscopy to meet the 10% analysis criteria (page 99). The 10% analysis criteria was achieved with the uranium and plutonium alpha spectroscopy performed on samples -001, -011, and -021. The extra data for sample -012 is not required, but is reported as additional characterization data. Samples HPPG-F-045 and HPPG-F-046 are field duplicates, correlating to systematic samples -012 and -017. The Data Quality Assessment which will be included in the RACR will provide an analysis and discussion of field duplicates for the project. The Instrument and Survey Summary table above lists the 3x3 NaI detector used for the gamma static measurements collected during sampling activities, and the instrument-specific gamma static IL listed in the sample tables on page one is developed from that instrument's RBA data.
Systematic sample histograms, box plots, Q-Q plots, and power curves are provided on pages 12-13. All sample results were below the applicable RGs. The number of samples collected was sufficient to meet project DQOs.
4) In accordance with Final Parcel G Work Plan Section 3.3.1 and 3.4.1, one biased sample was collected since all follow-up static measurements were below the ROC-specific critical levels. The biased sample was collected from the location of the highest gross gamma scan measurement. TestAmerica sample results are attached (pages 81-98). A map of the biased sample location is presented on page 11. Biased sample results were all below the applicable RGs.
Conclusions: In accordance with the DQOs in Section 3.1 of the Final Parcel G Work Plan, final analytical results for all samples from the RSY pad were shown by a point by point comparison to meet the RGs. Graphical comparisons demonstrated that ROC concentrations were consistent with background. RSY 28 Use 1 contains soil from Hunters Point Naval Shipyard Parcel G Phase 1 excavation Former Building Sites 317, 364, 365 SU 28C. APTIM requests RASO concurrence to release this soil as Non-LLRW. Disposition: This soil shall be used as backfill for Former Building Sites 317, 364, 365 SU 28.

Soil Scan Statistics

Statistical Summary

Dataset		PG-RSY-28-U1				
ROI		Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03		3.01	28.05	12.60	12.03	3.57
ROI-06		53.10	120.27	85.55	85.19	9.84
ROI-07		37.07	99.21	66.56	66.14	8.64
ROI-08		68.13	147.35	107.48	107.24	11.38
ROI-10		1,900.12	2,440.53	2,166.60	2,167.92	83.94

Statistical Summary Reference Background

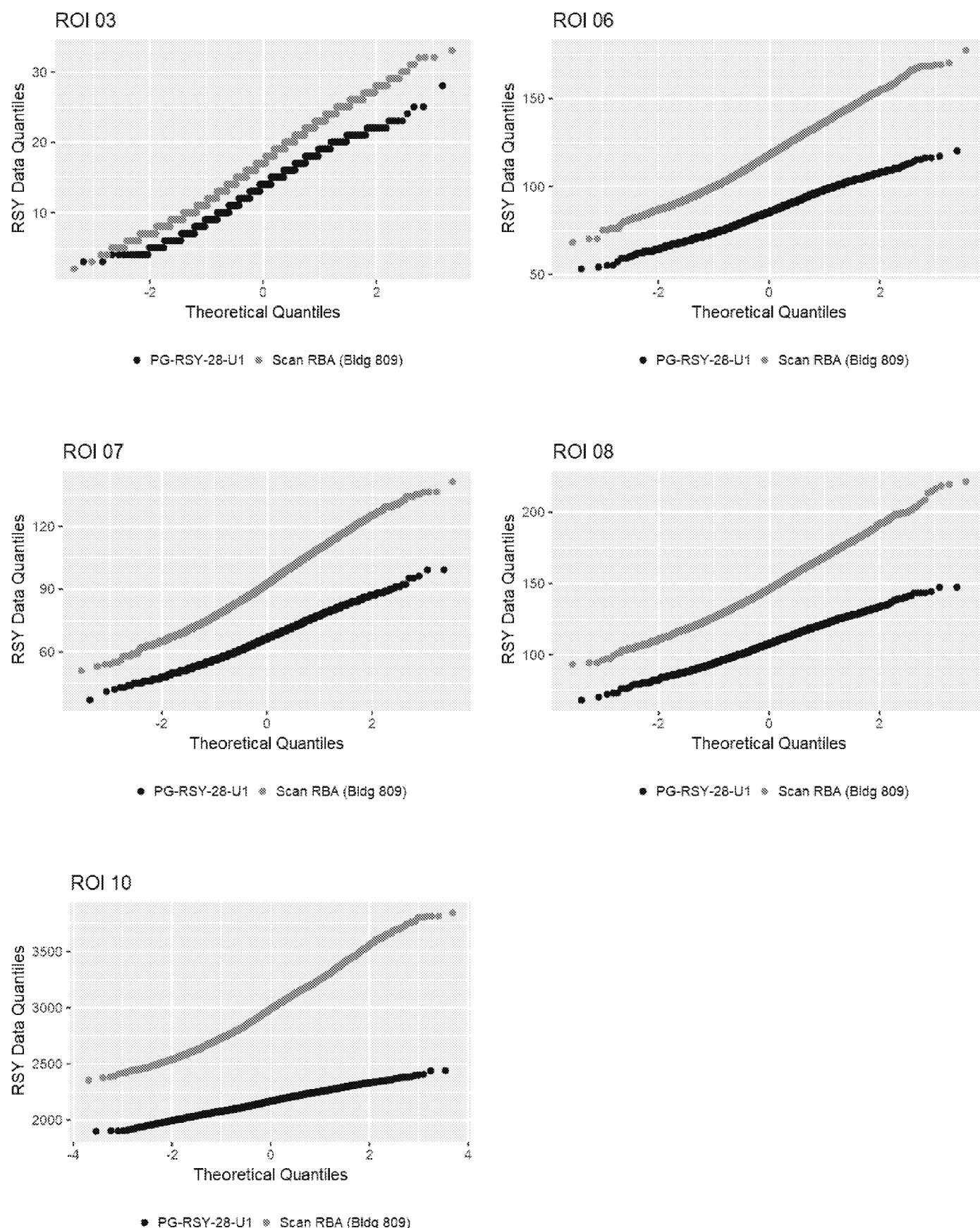
TYPE		Scan RBA (Bldg 809)				
ROI		Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03		2.00	33.08	16.21	16.04	4.13
ROI-06		68.15	177.45	117.58	117.26	15.50
ROI-07		51.11	141.33	92.34	91.24	13.43
ROI-08		93.19	221.48	146.24	145.30	18.21
ROI-10		2,354.11	3,845.31	2,995.57	2,989.64	255.66

cps = counts per second

Dataset	Number of Data Points
PG-RSY-28-U1	2788
Scan RBA (Bldg 809)	4632

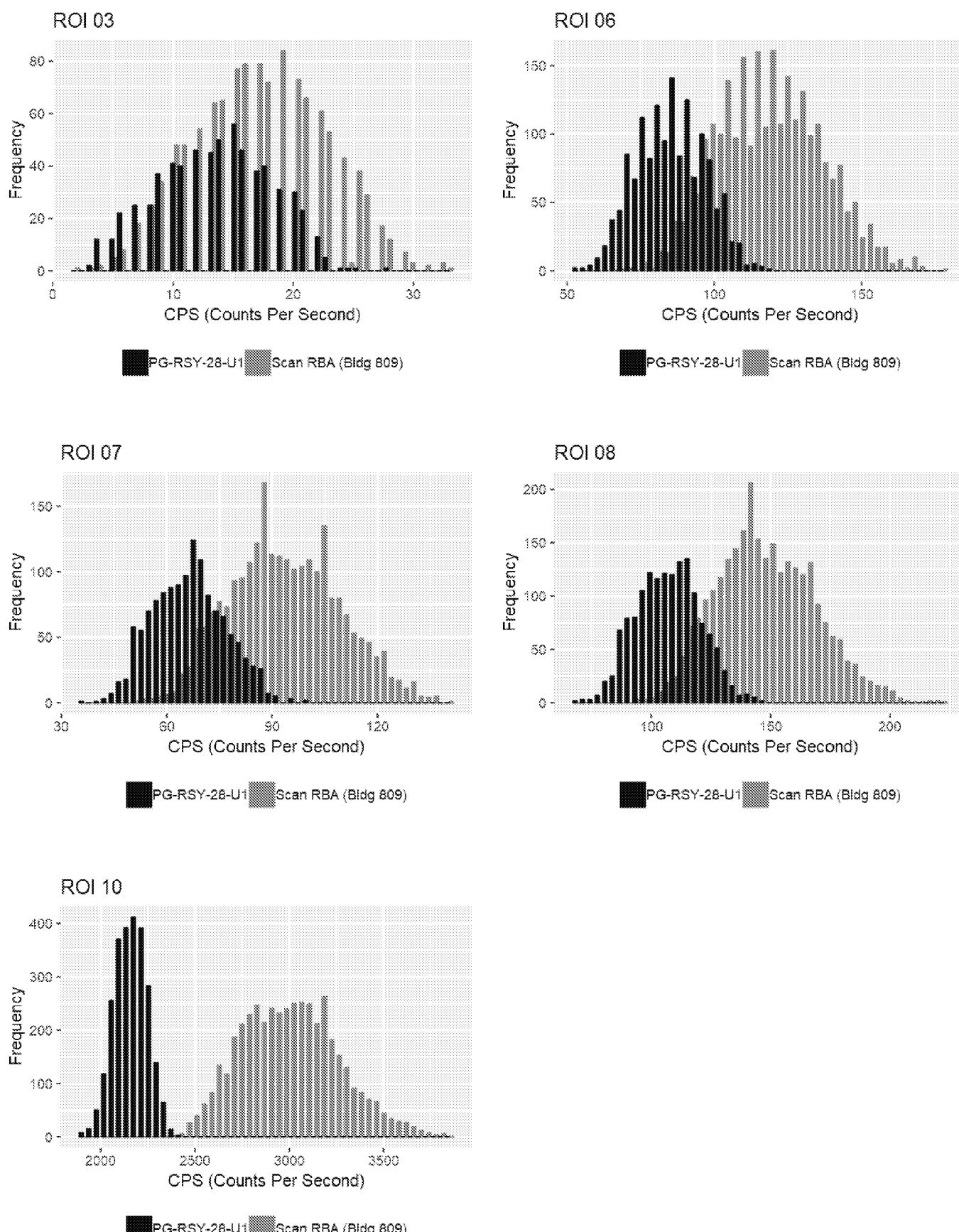
Soil Scan Statistics

Normal Q-Q Plots



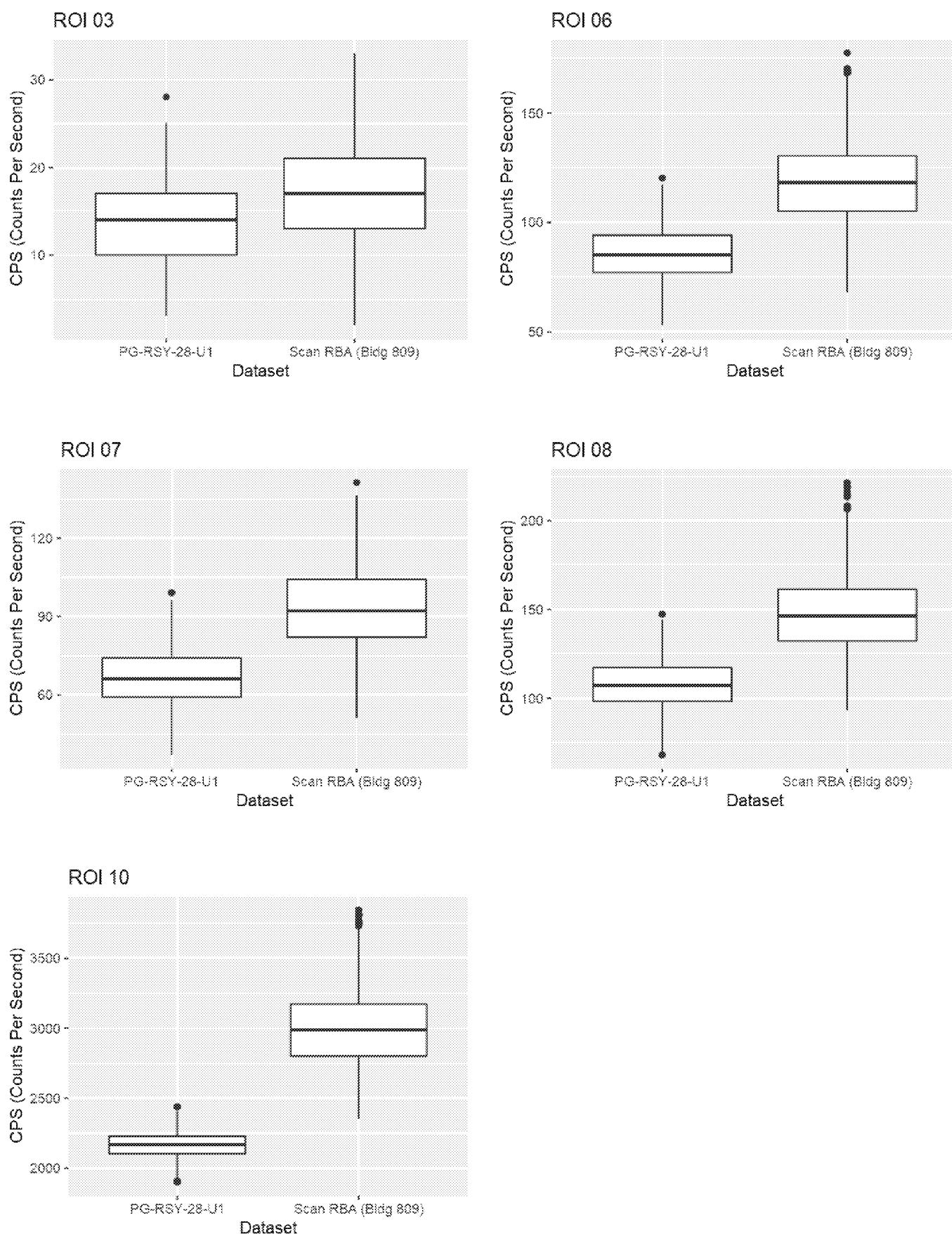
Soil Scan Statistics

Histograms

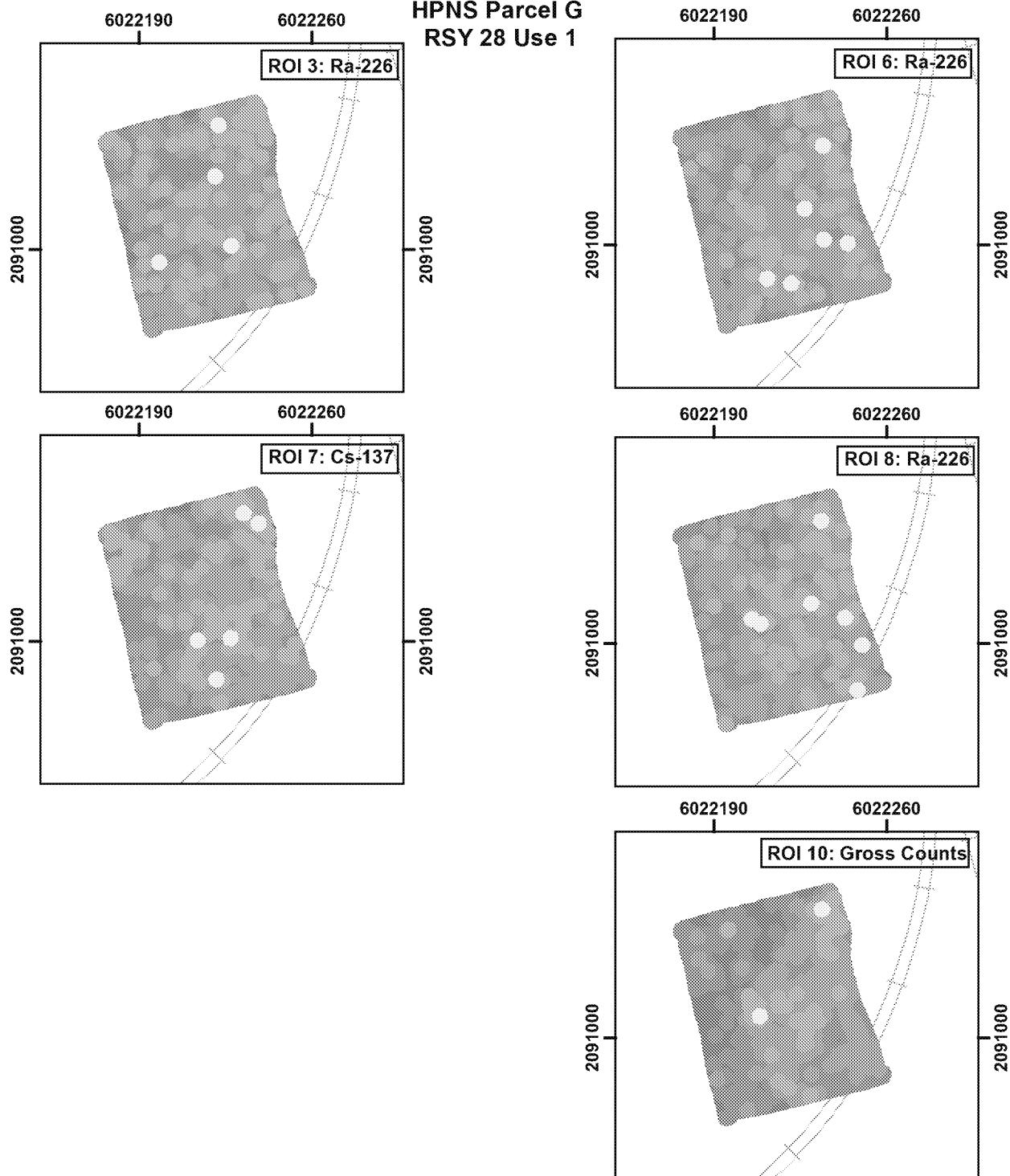


Soil Scan Statistics

Box Plots



RSI Data Plots
HPNS Parcel G
RSY 28 Use 1



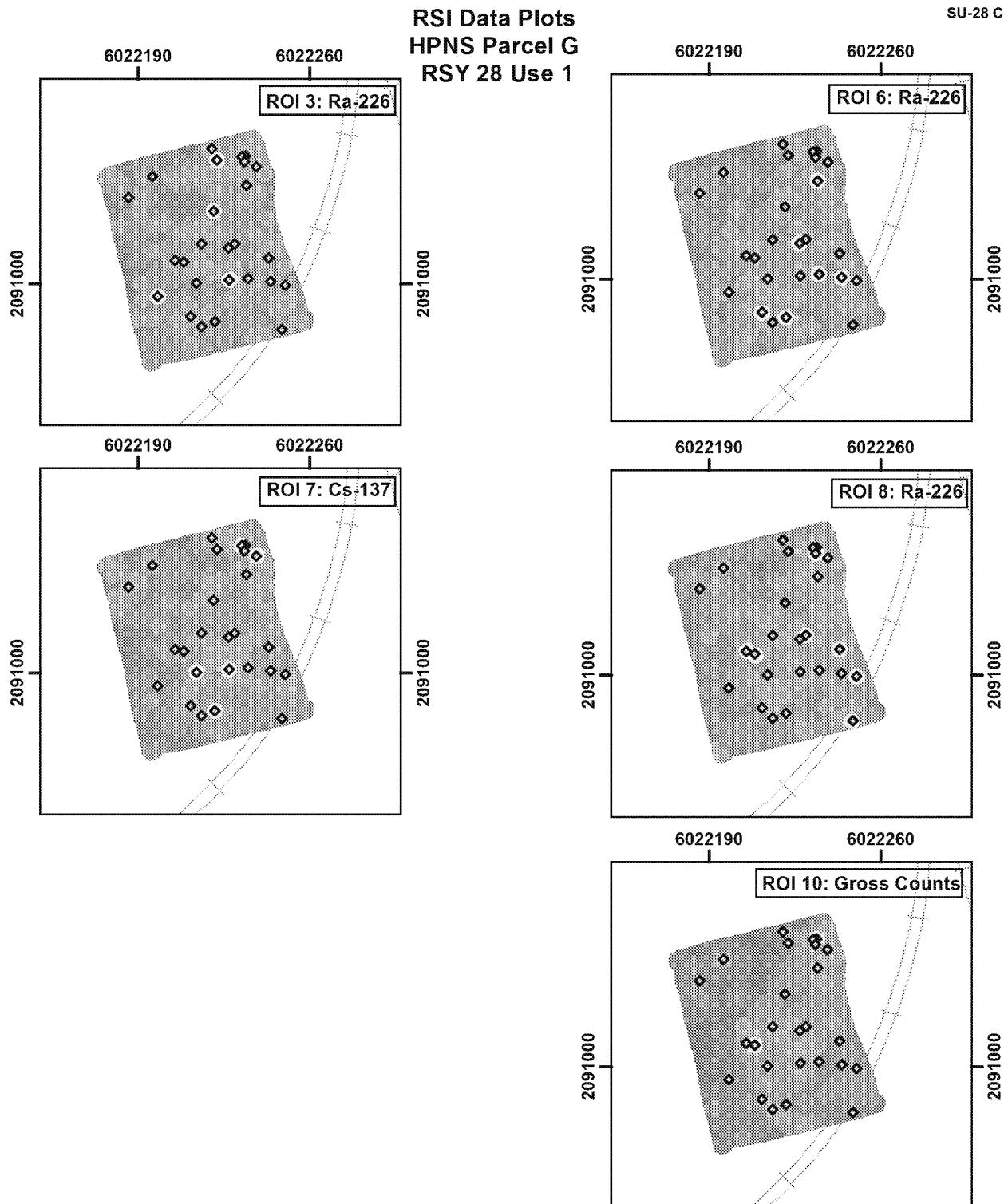
RS 700 Gamma Walkover Survey Data (VD1)

- | | |
|--------------------|----------------------|
| > 3 std dev | > -1 to < 0 std dev |
| ● | ● |
| > 2 to < 3 std dev | > -2 to < -1 std dev |
| ● | ● |
| > 1 to < 2 std dev | > -3 to < -2 std dev |
| ● | ● |
| > 0 to < 1 std dev | < -3 std dev |
| ● | ● |

0 25 50 100
Feet

Coordinate system: CSP Zone III, NAD83, US Survey Foot





RS 700 Gamma Walkover Survey Data (VD1)

- | | |
|-----------------------|------------------------|
| ◆ Follow-Up Locations | ● > -1 to < 0 std dev |
| > 3 std dev | ● > -2 to < -1 std dev |
| ● > 2 to < 3 std dev | ● > -3 to < -2 std dev |
| ● > 1 to < 2 std dev | ● < -3 std dev |
| ● > 0 to < 1 std dev | |

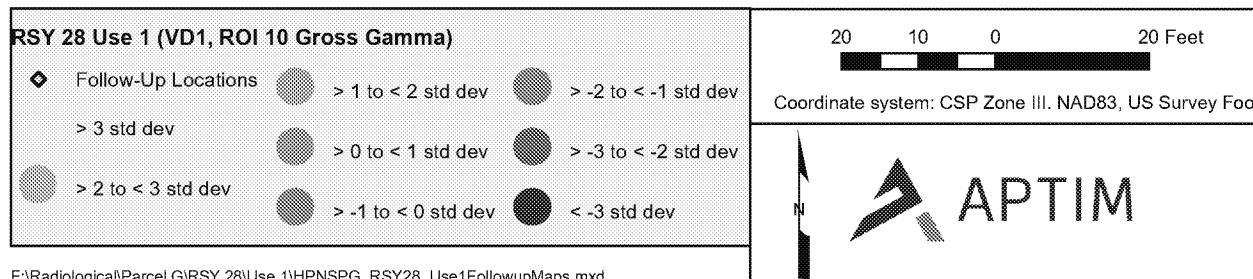
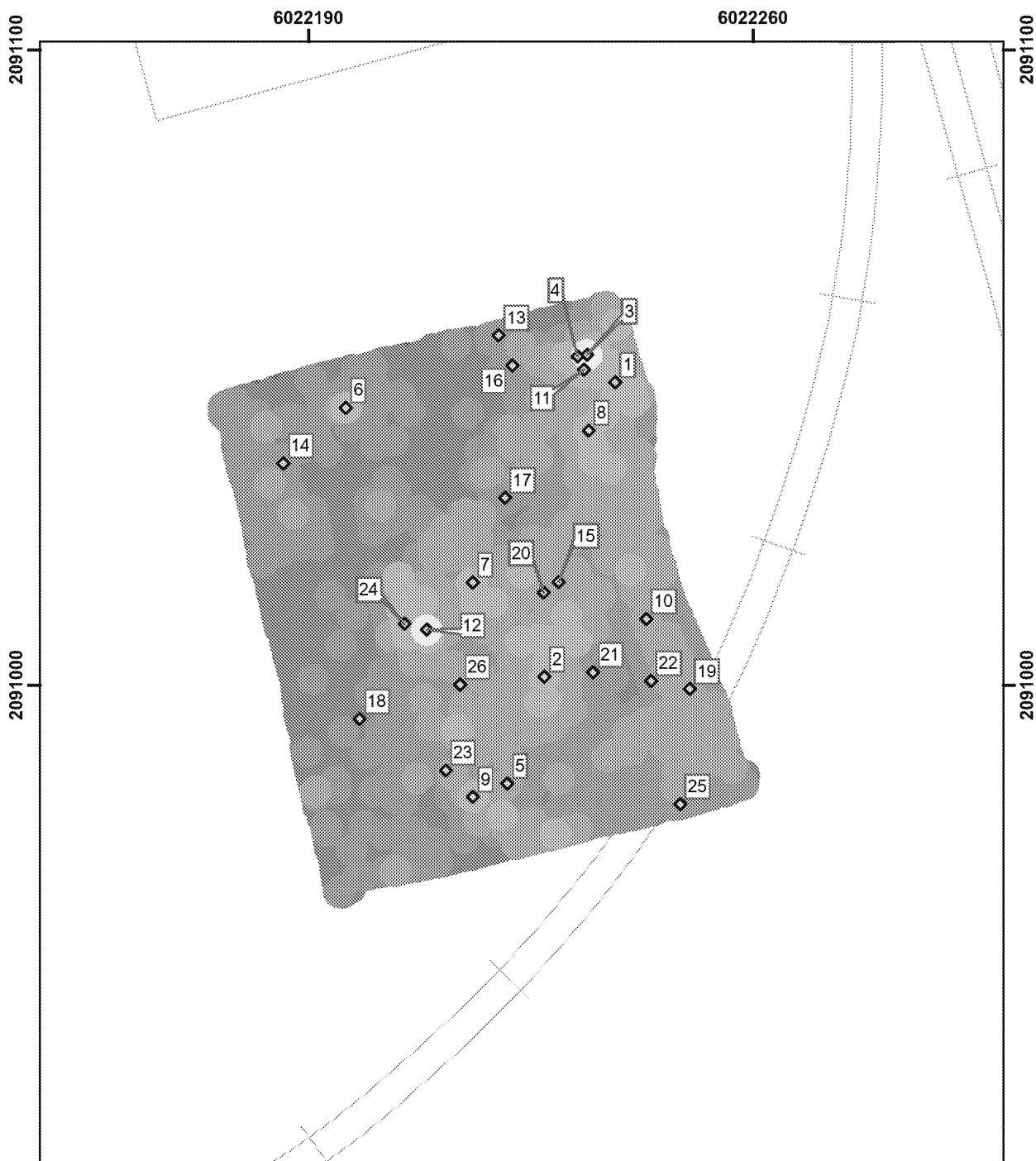
0 25 50 100
Feet

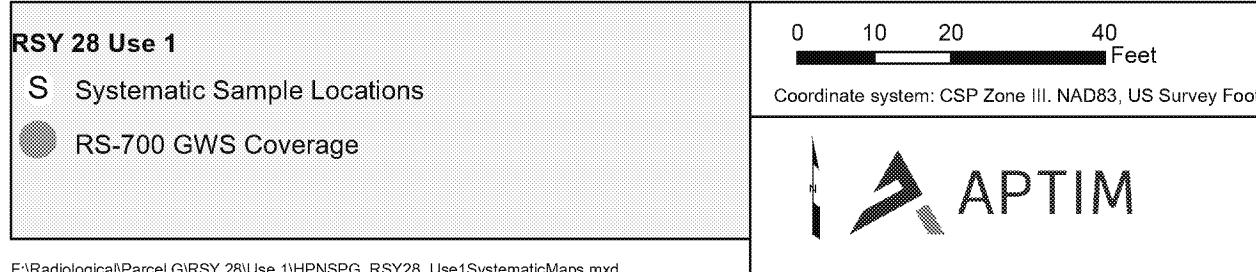
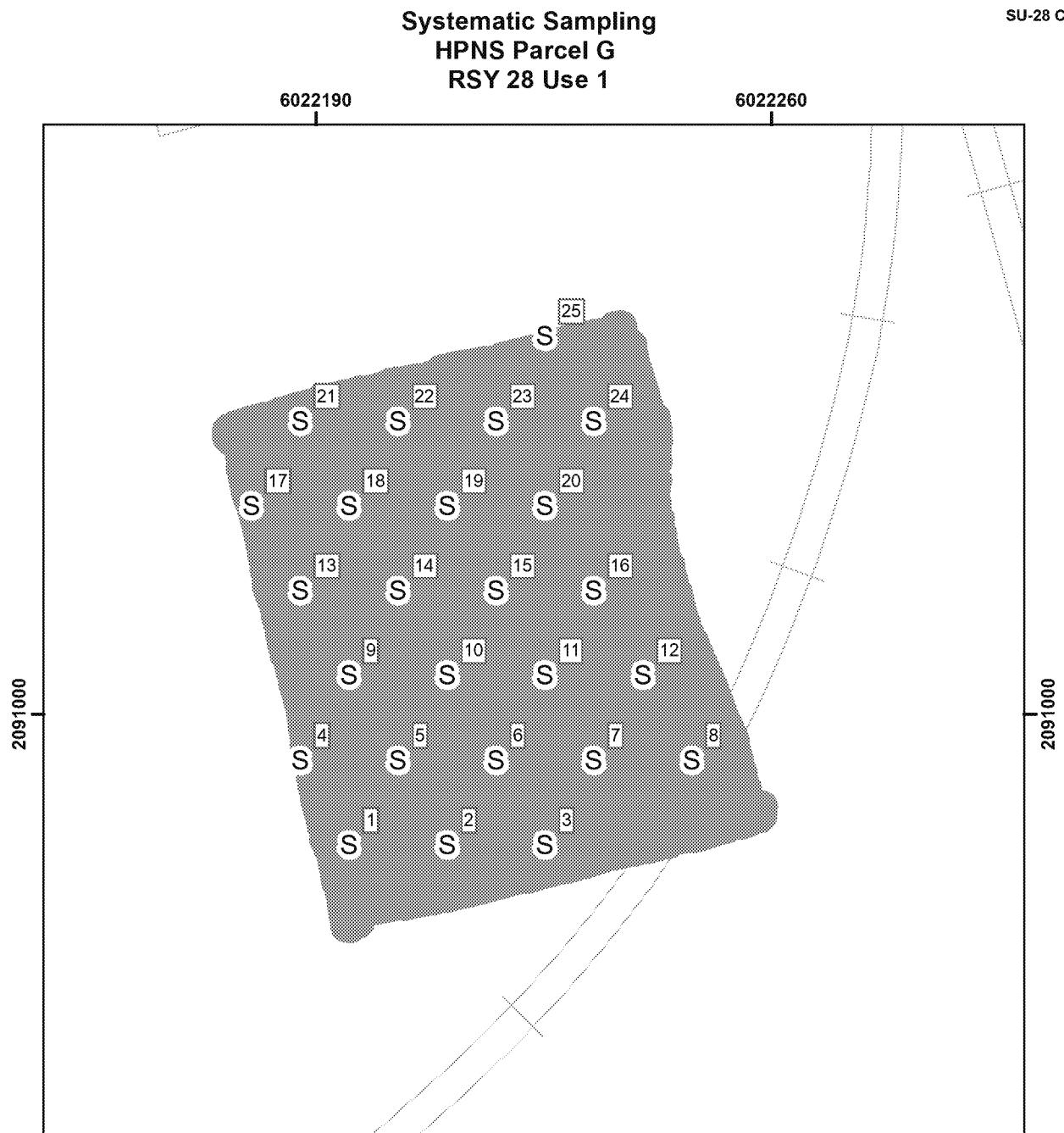
Coordinate system: CSP Zone III, NAD83, US Survey Foot



**Follow-Up Static Survey
HPNS Parcel G
RSY 28 Use 1**

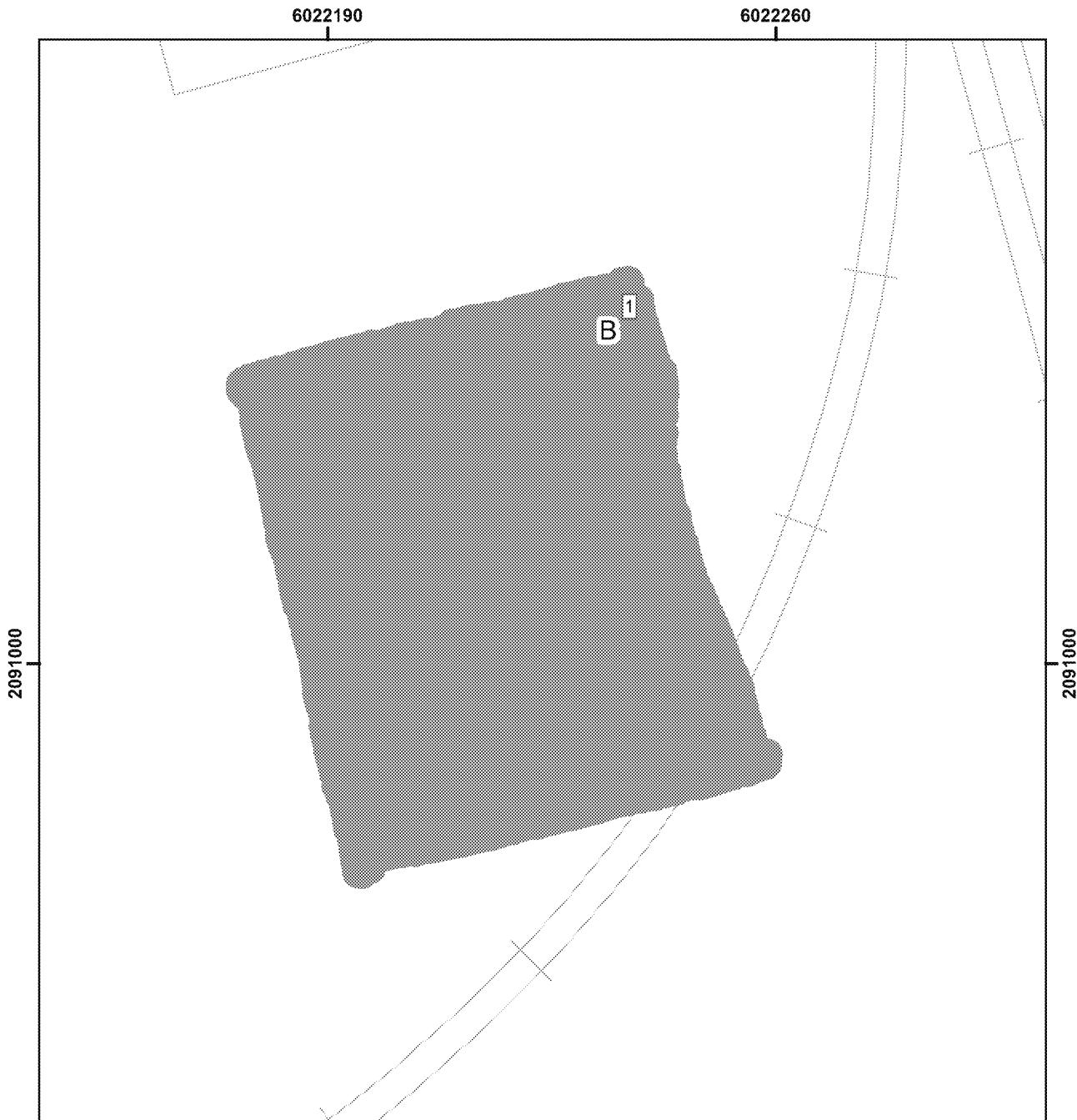
SU-28 C





**Biased Sampling
HPNS Parcel G
RSY 28 Use 1**

SU-28 C



RSY 28 Use 1

B Biased Sample Location

● RS-700 GWS Coverage

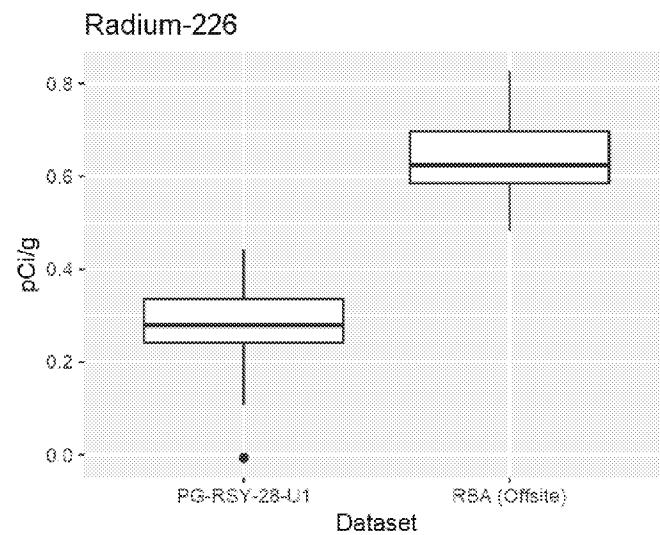
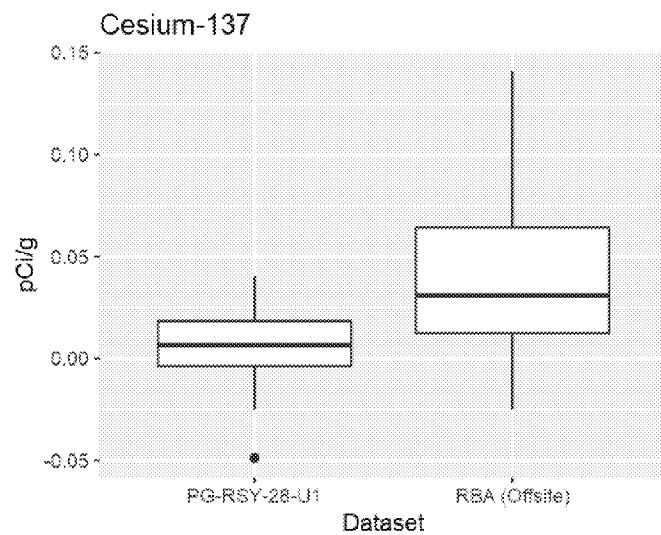
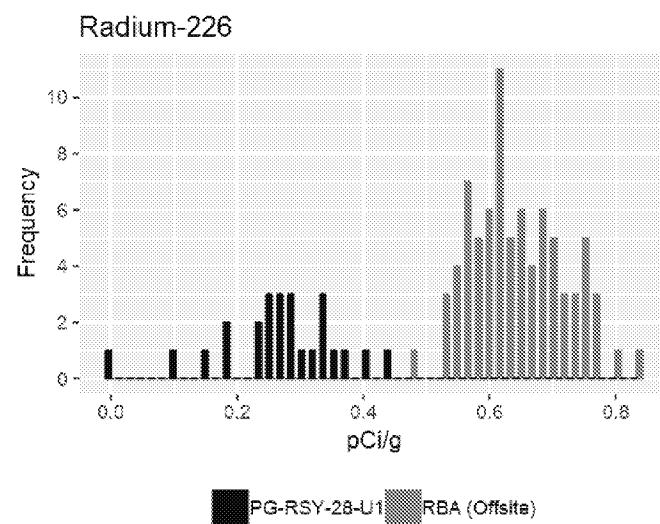
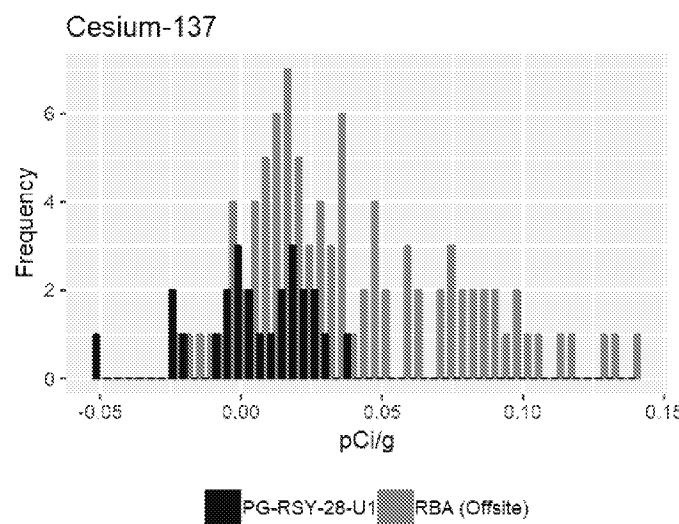
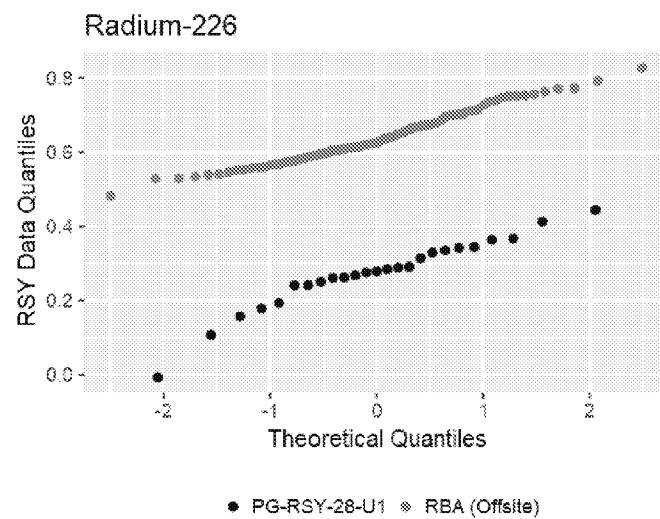
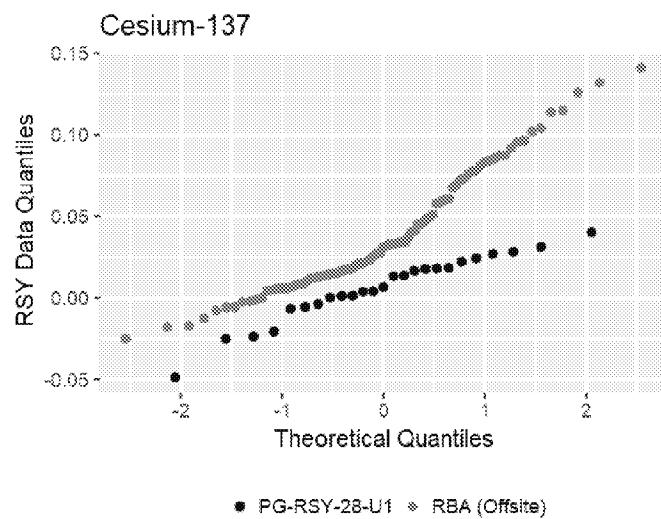
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Coordinate system: CSP Zone III, NAD83, US Survey Foot



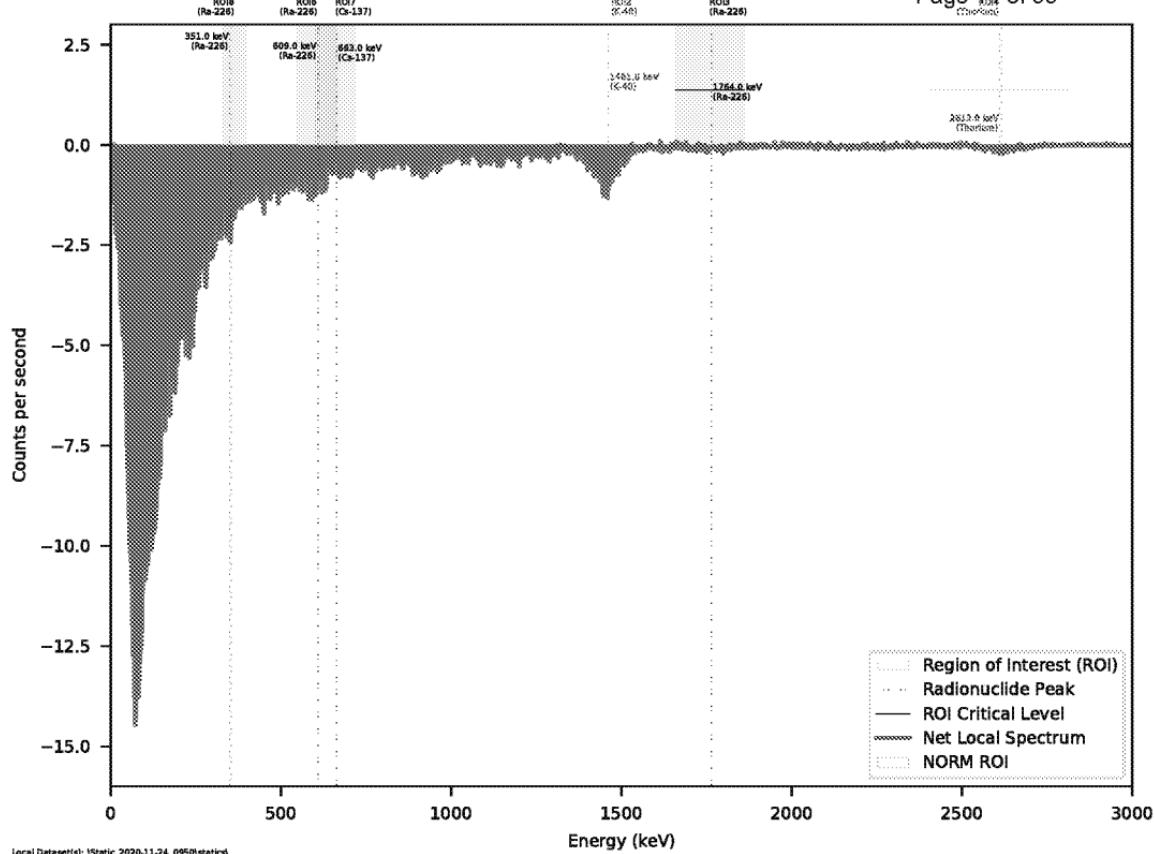
APTIM

Soil Sample Statistics



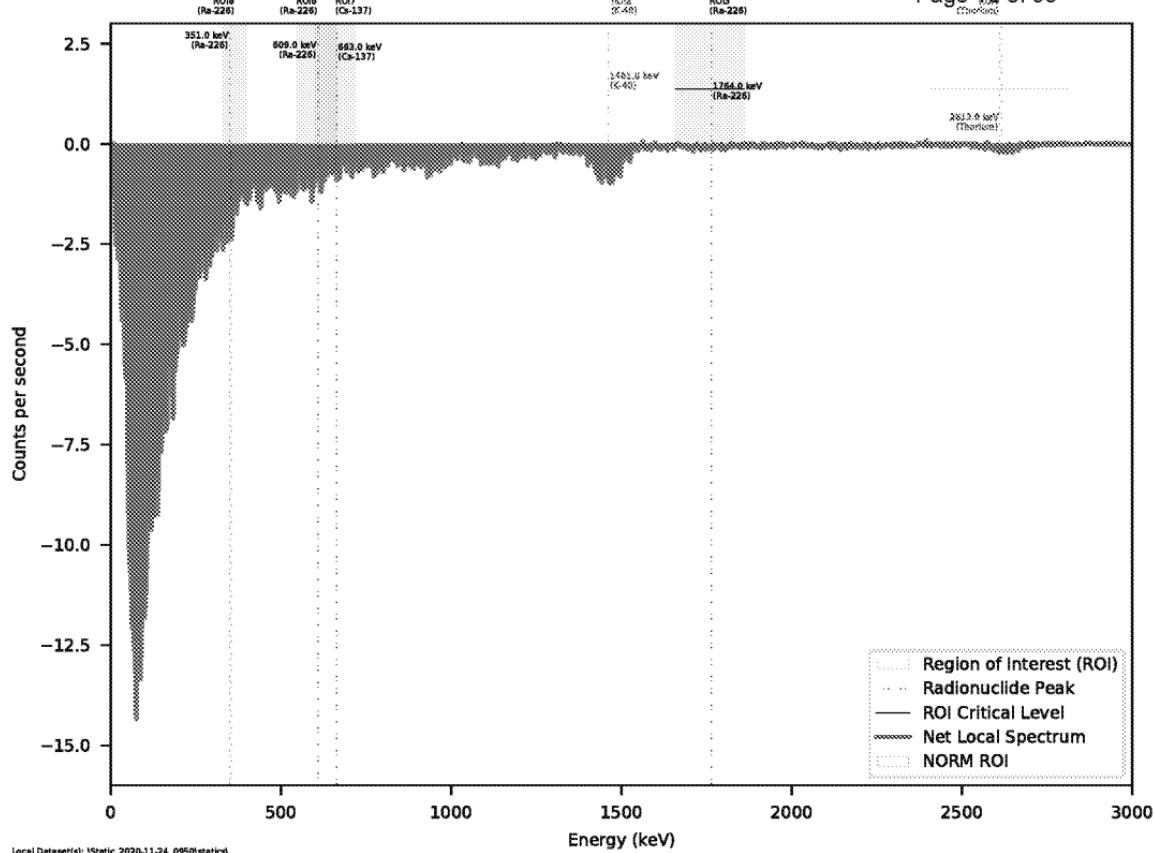
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Net Gamma Spectrum, Static Location: 2

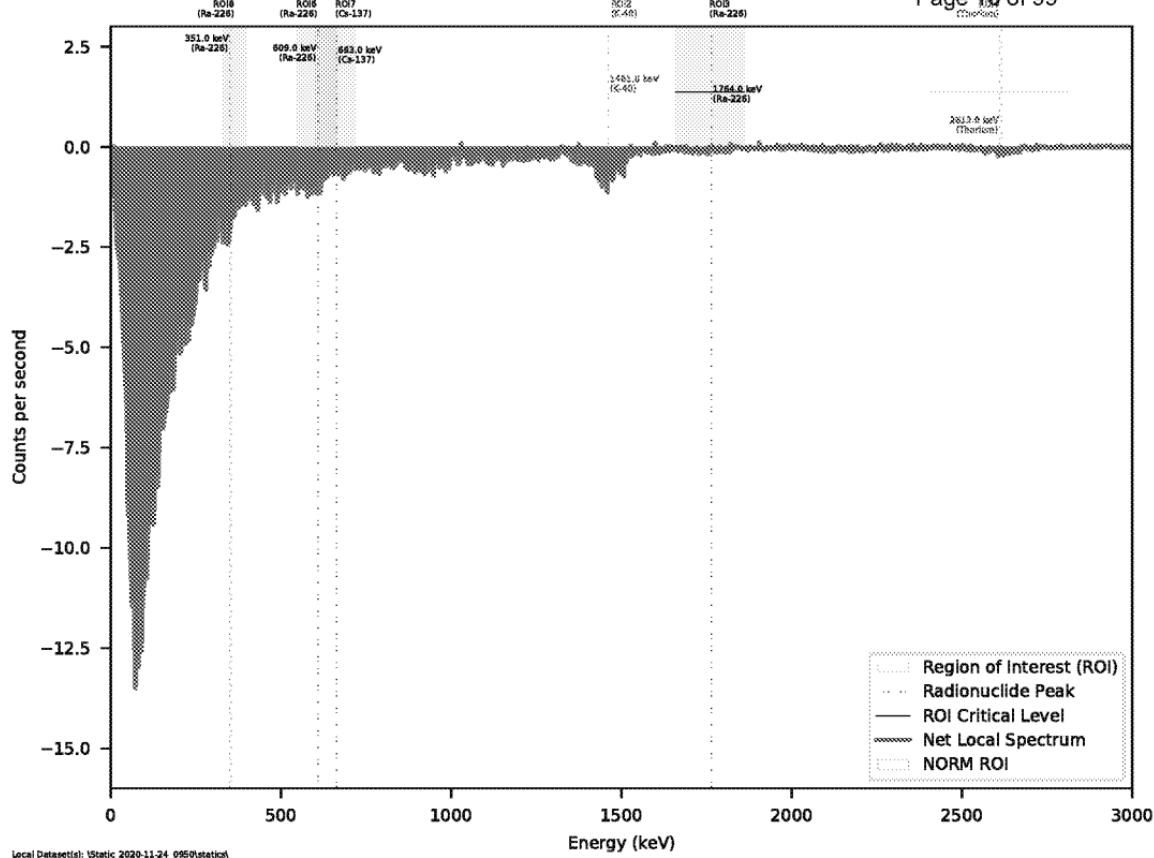
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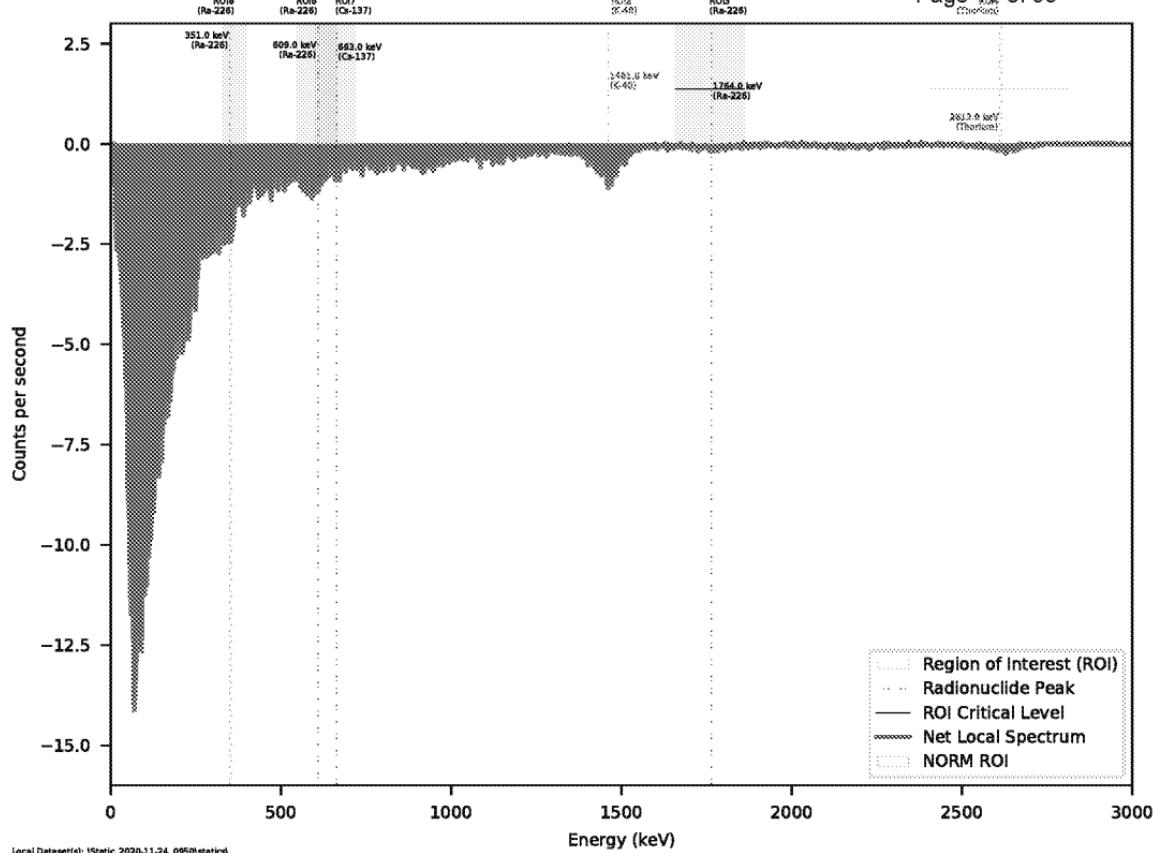
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Net Gamma Spectrum, Static Location: 4

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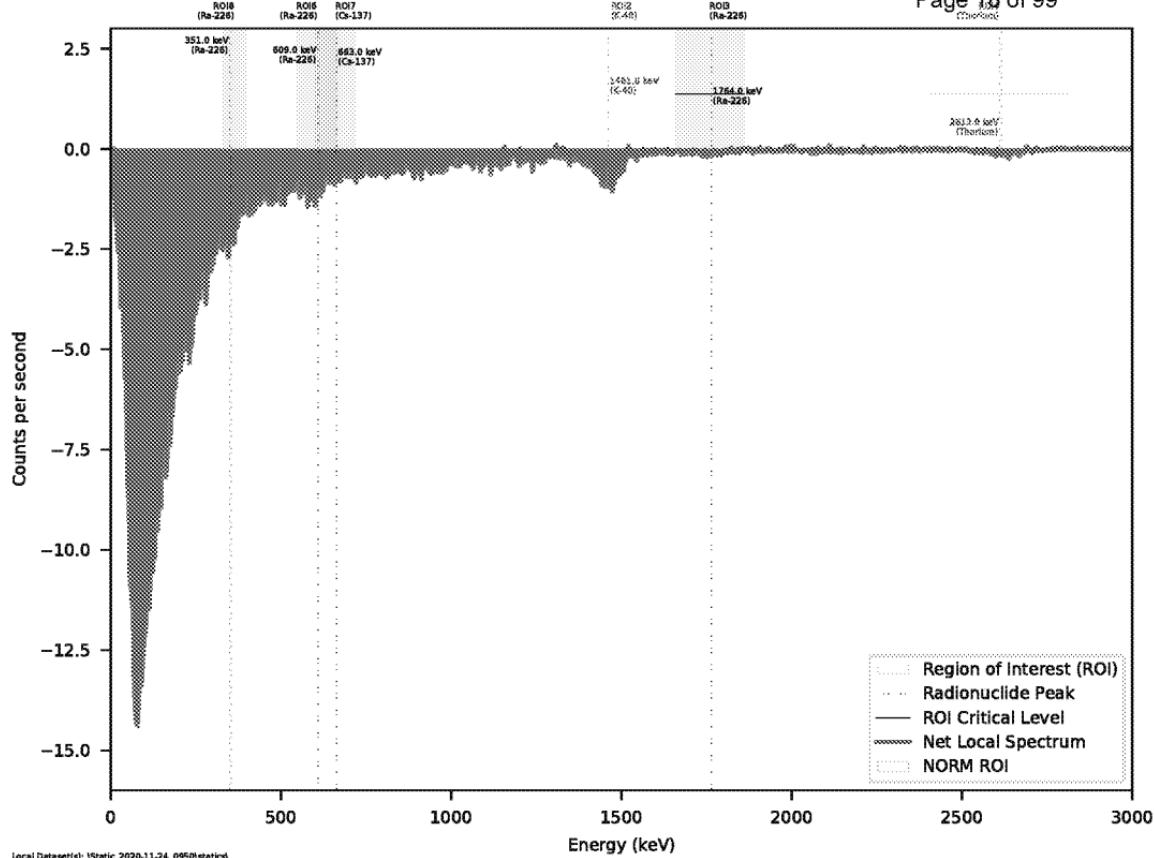
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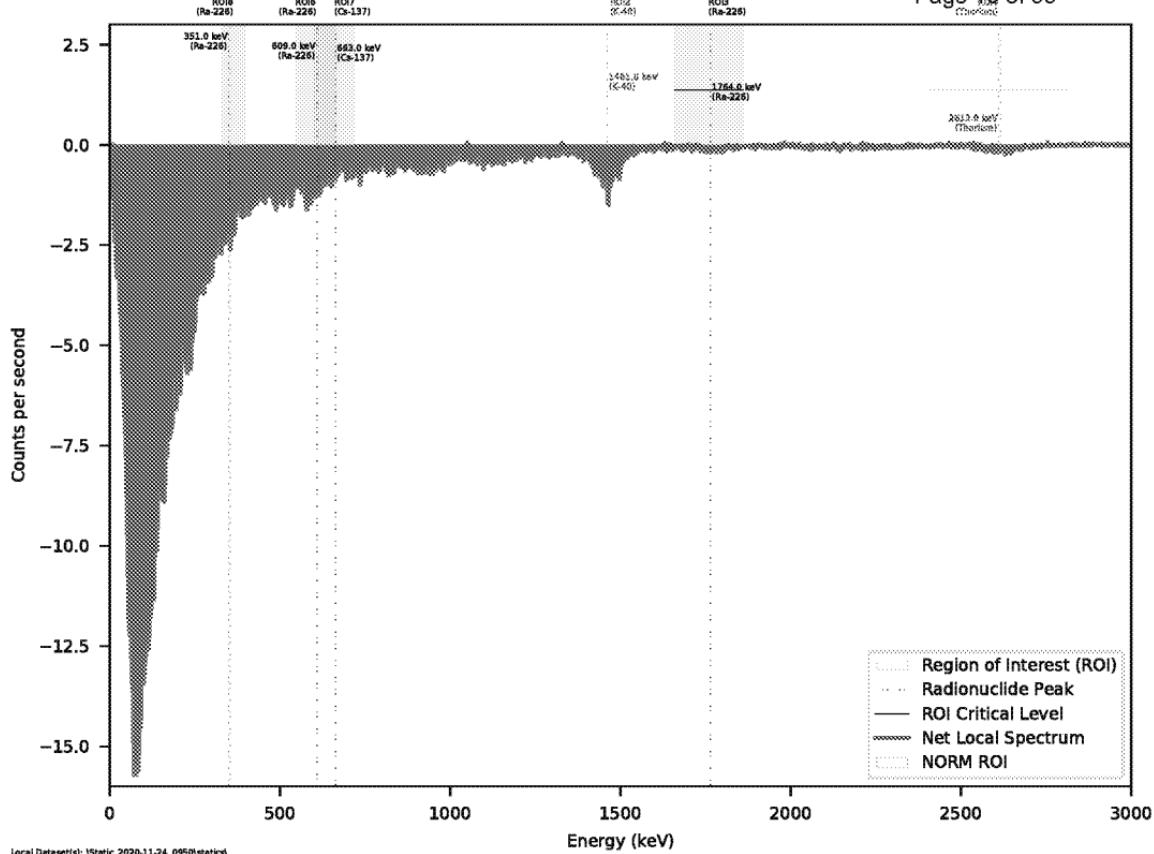
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Net Gamma Spectrum, Static Location: 6

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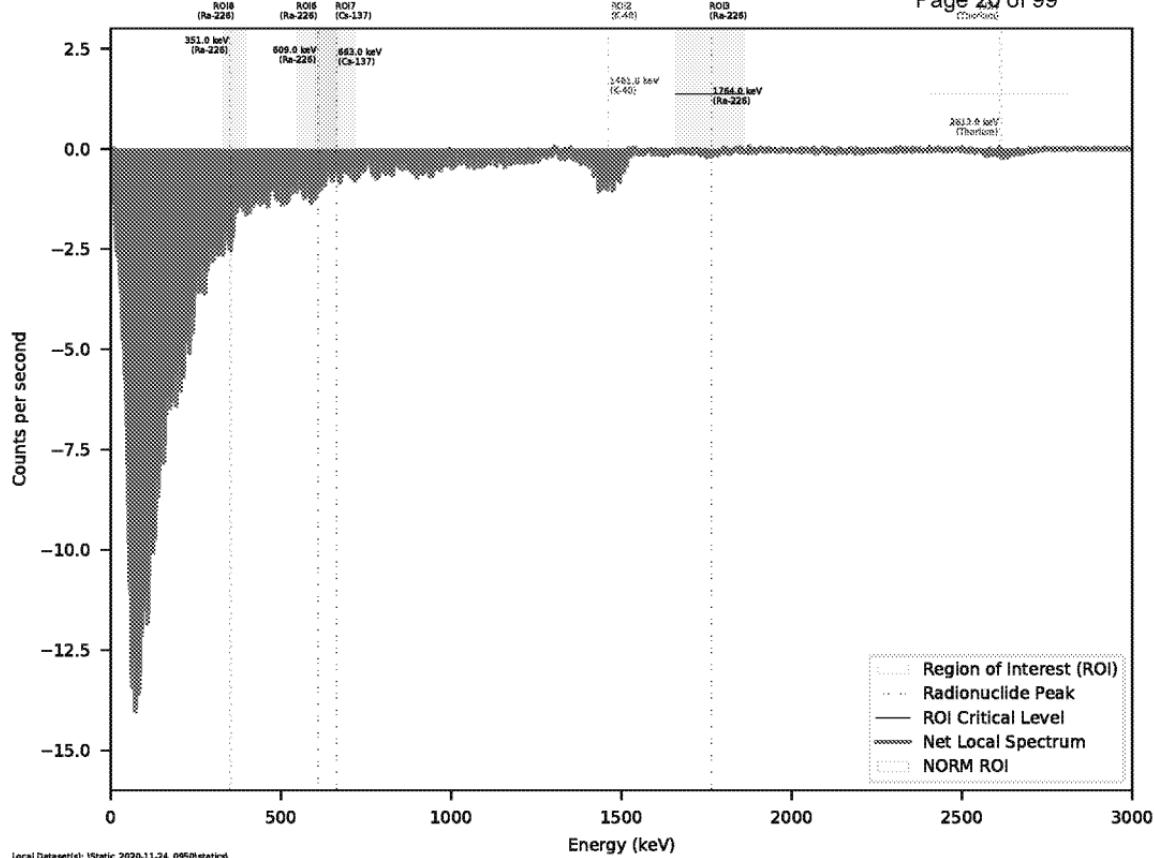
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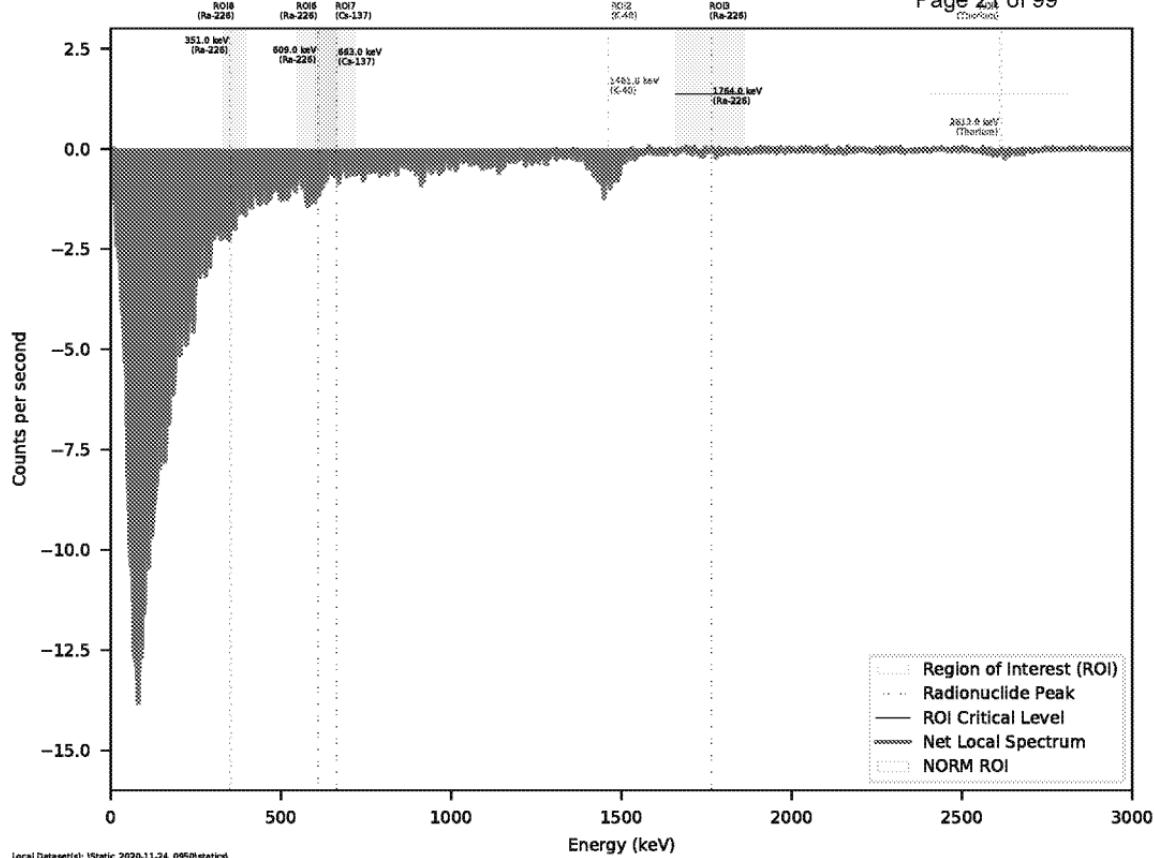
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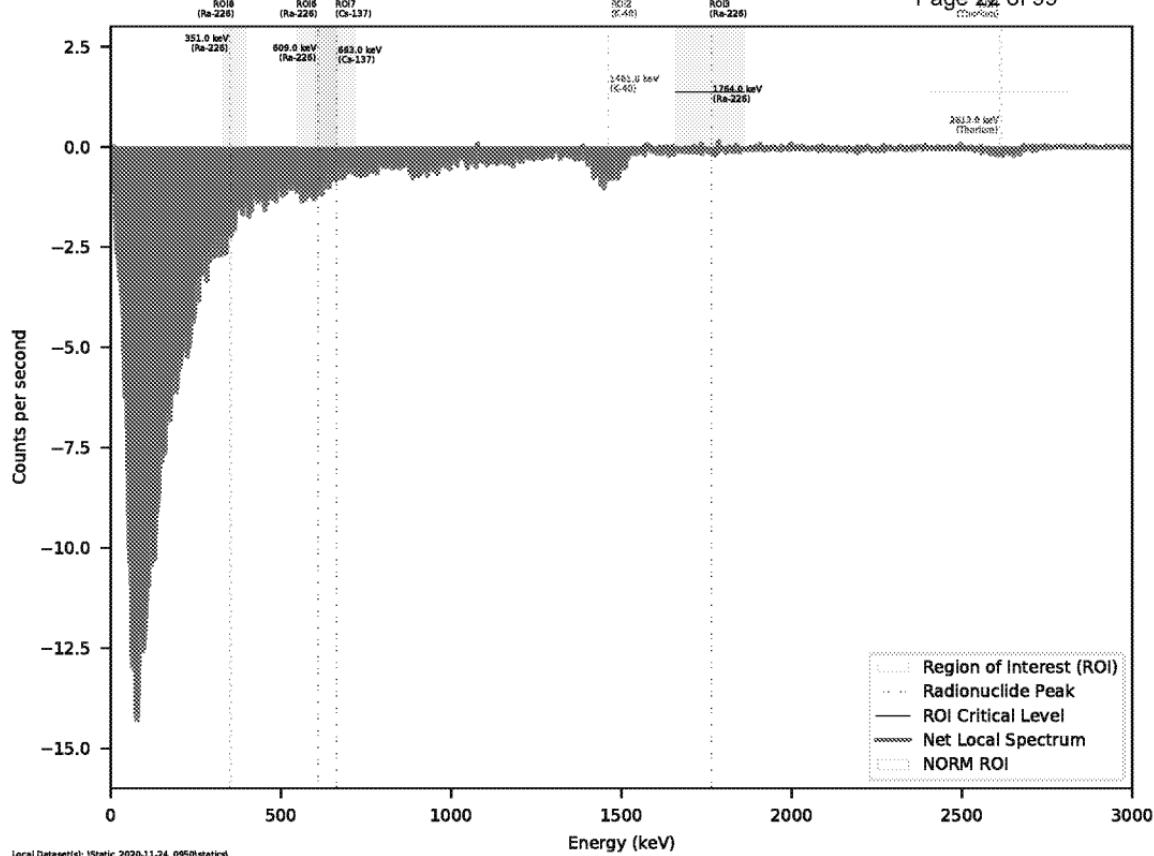
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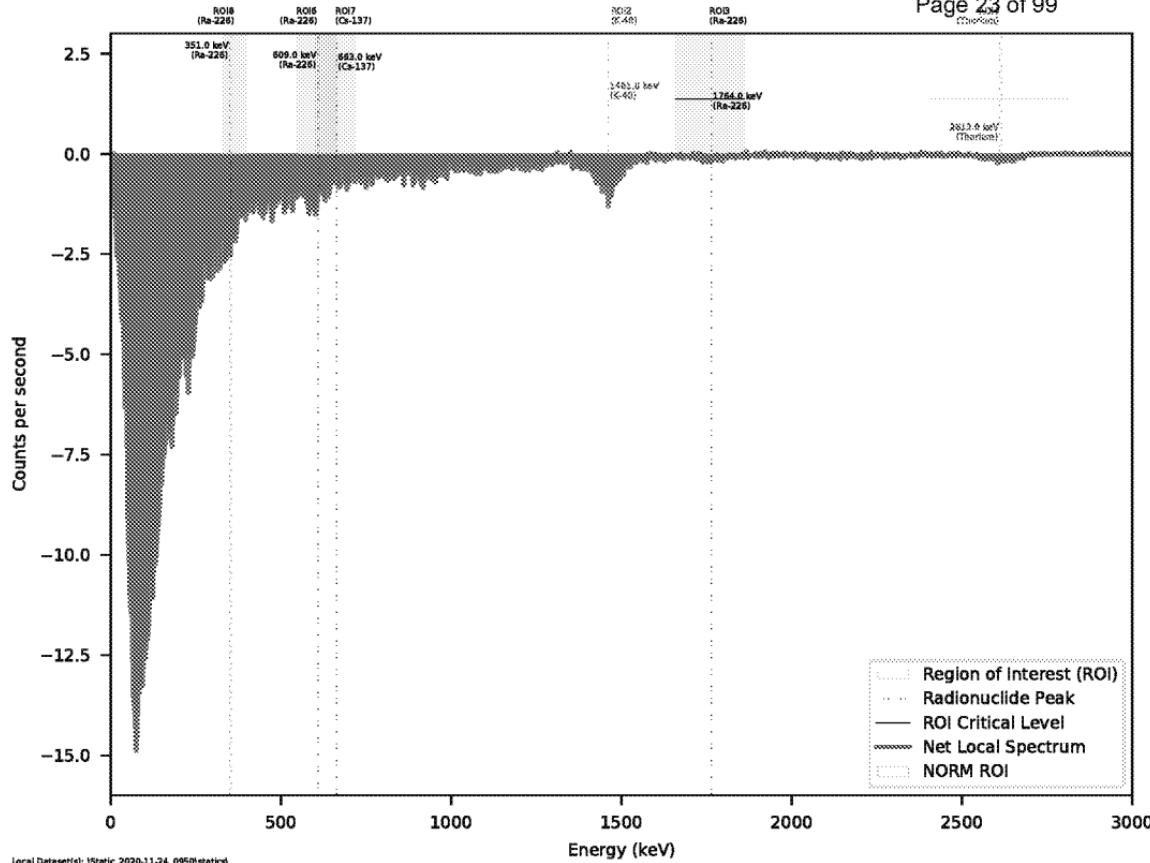
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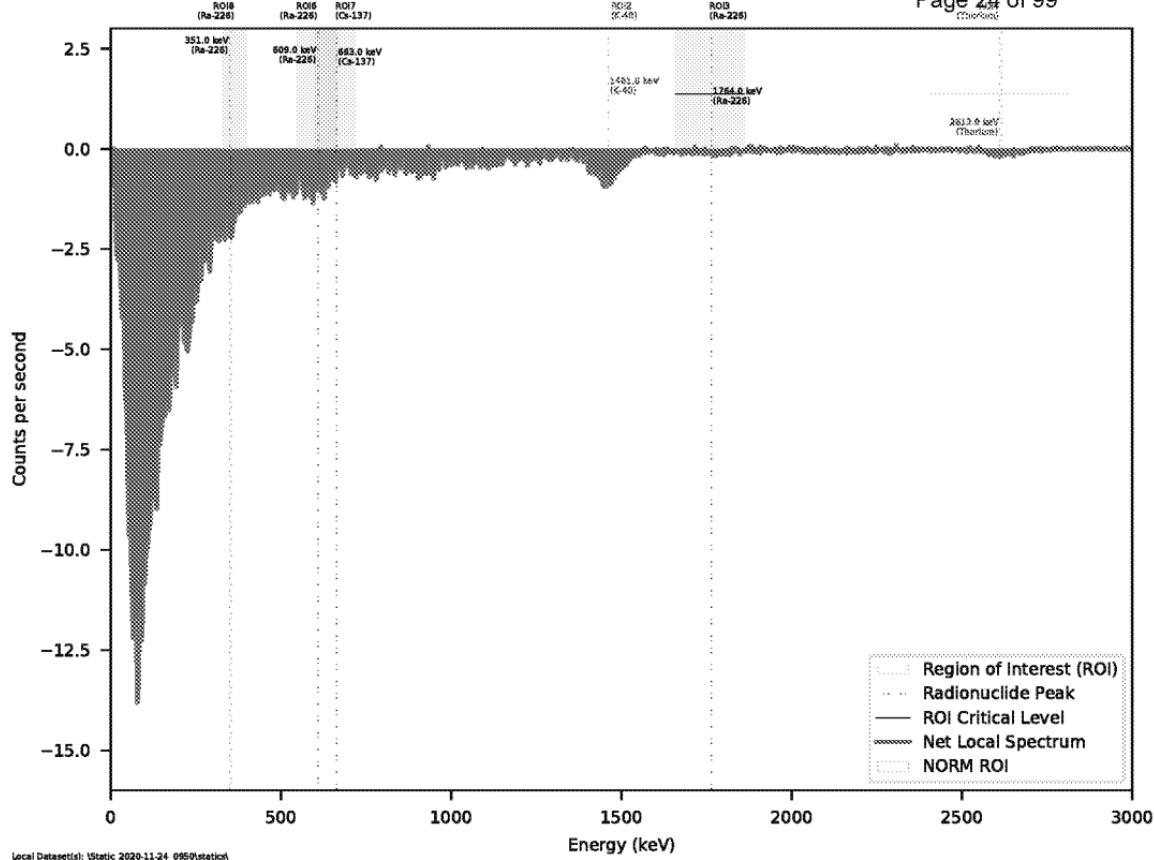
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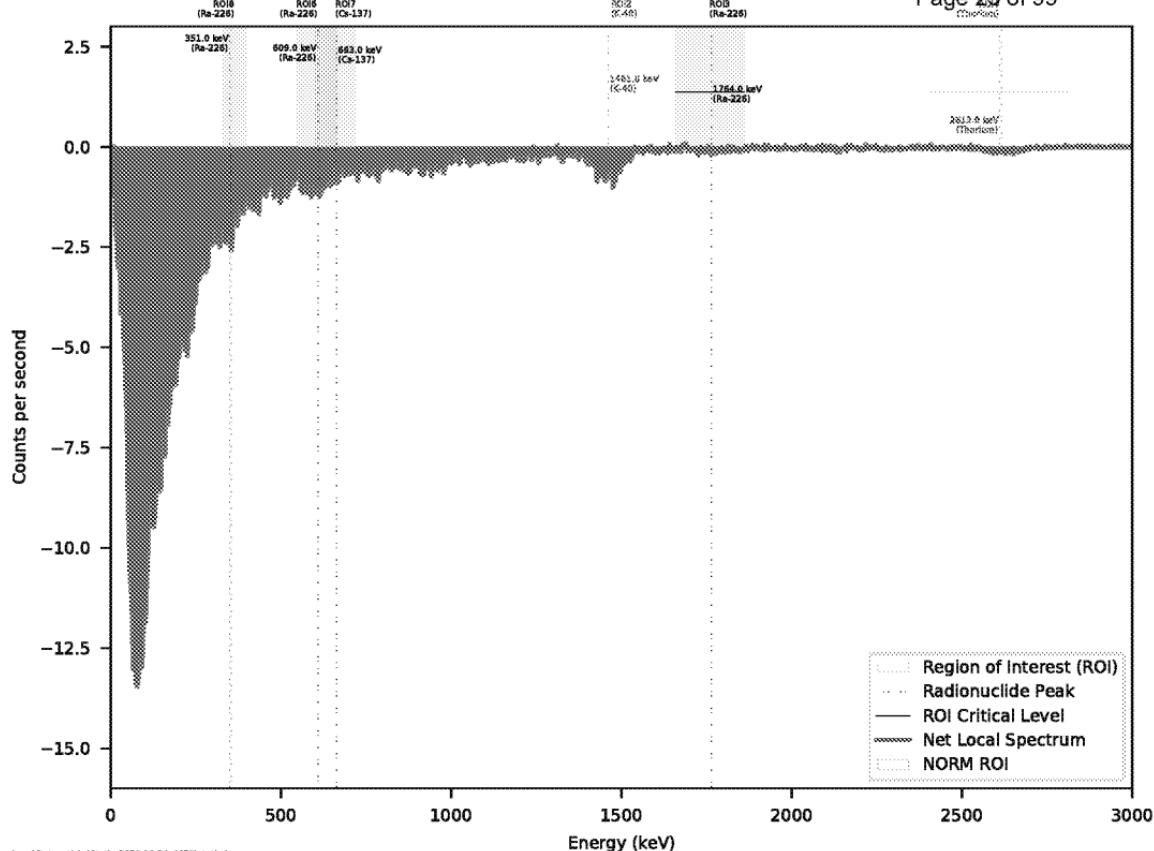
Net Gamma Spectrum, Static Location: 11

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Net Gamma Spectrum, Static Location: 12

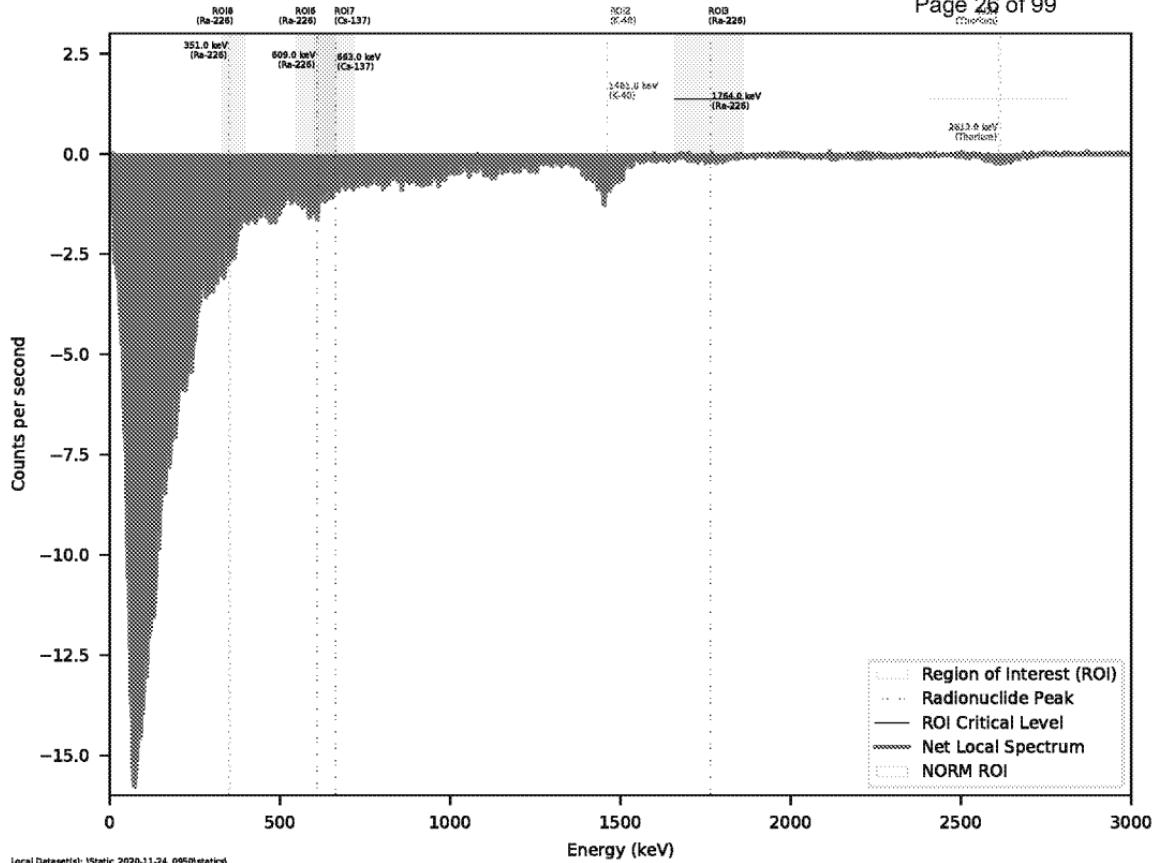
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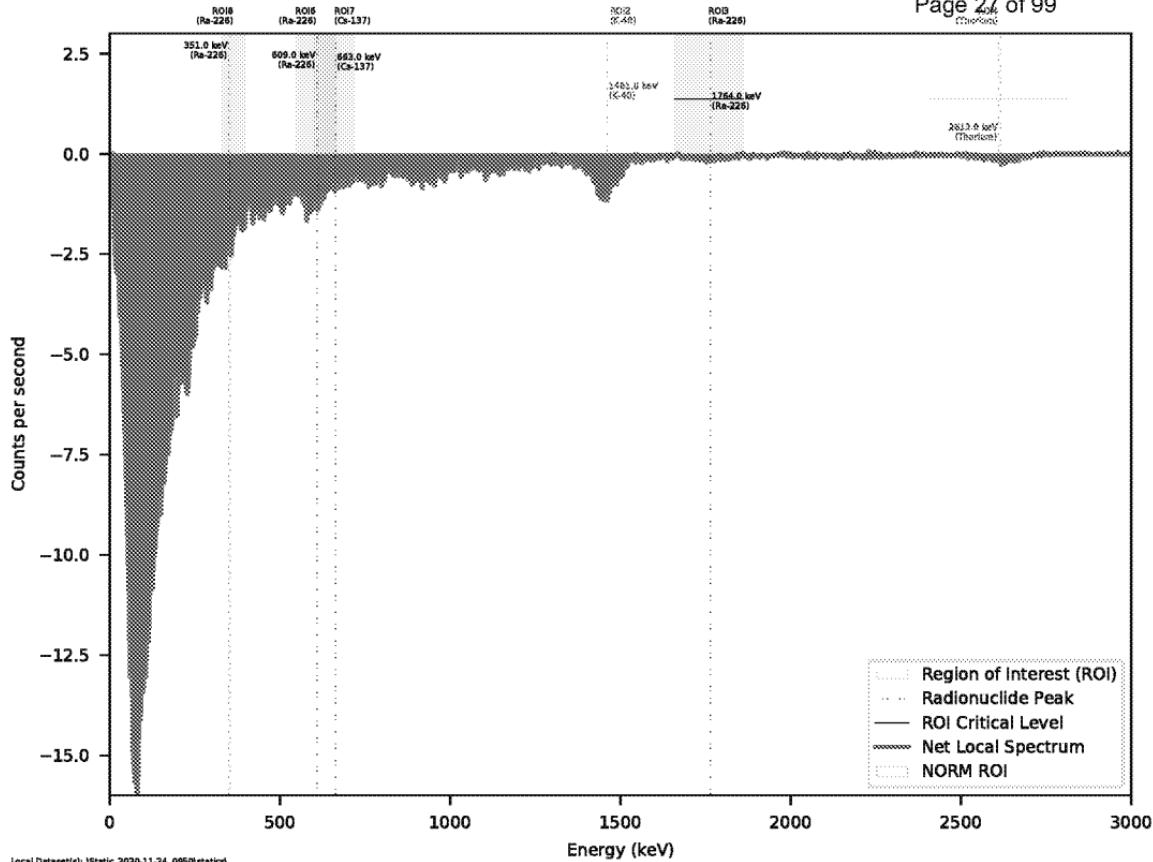
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Net Gamma Spectrum, Static Location: 14

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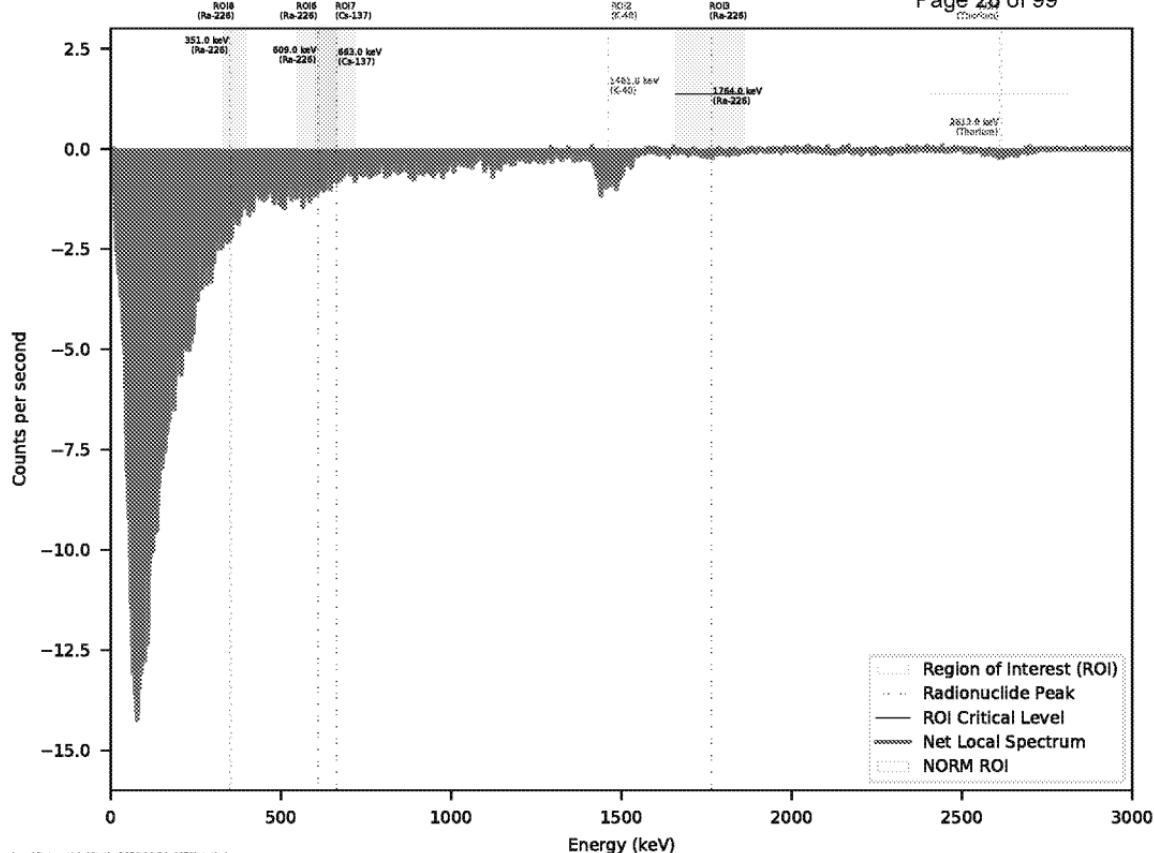
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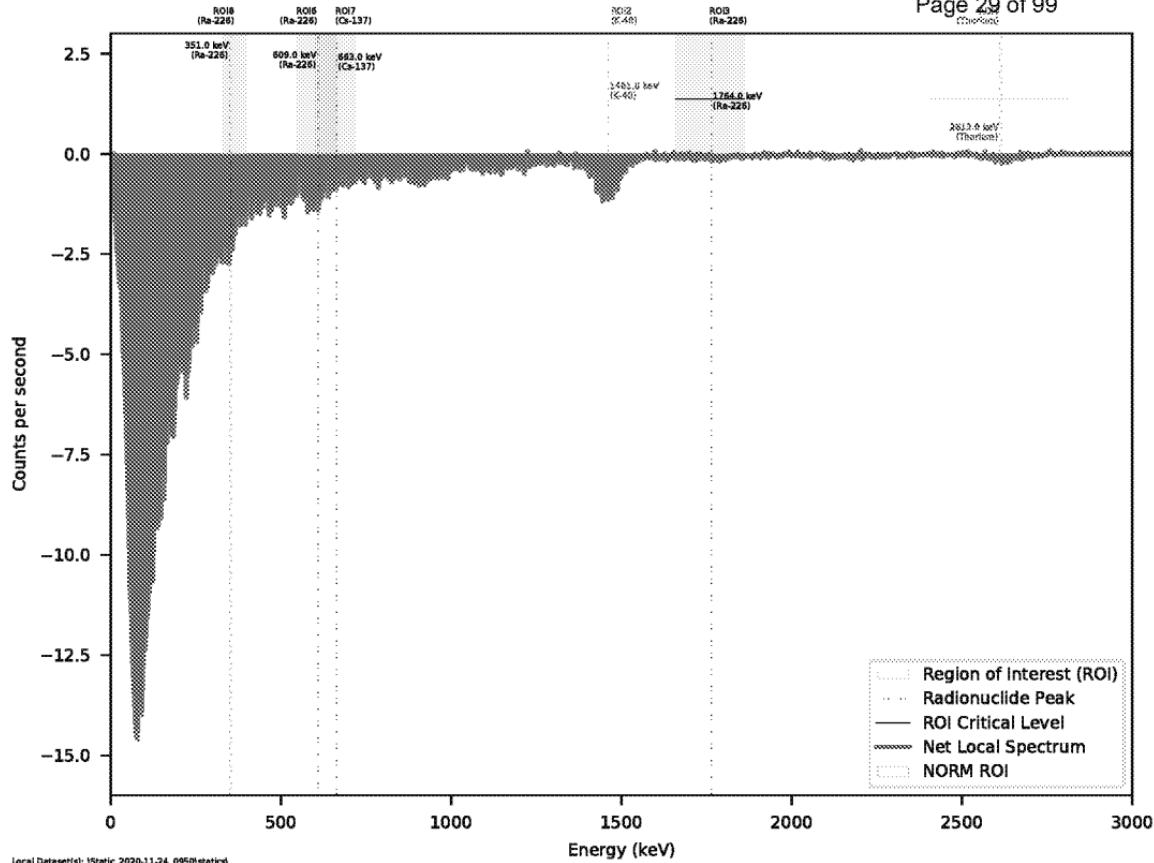
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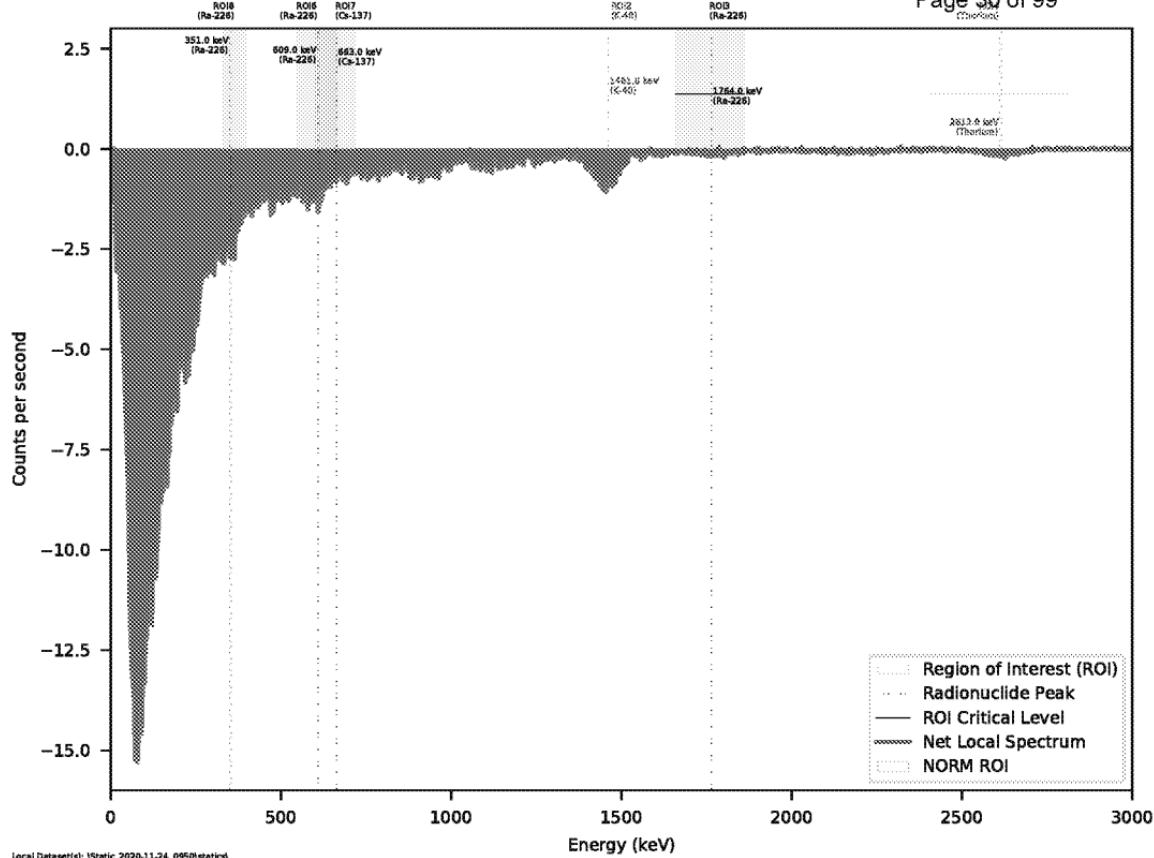
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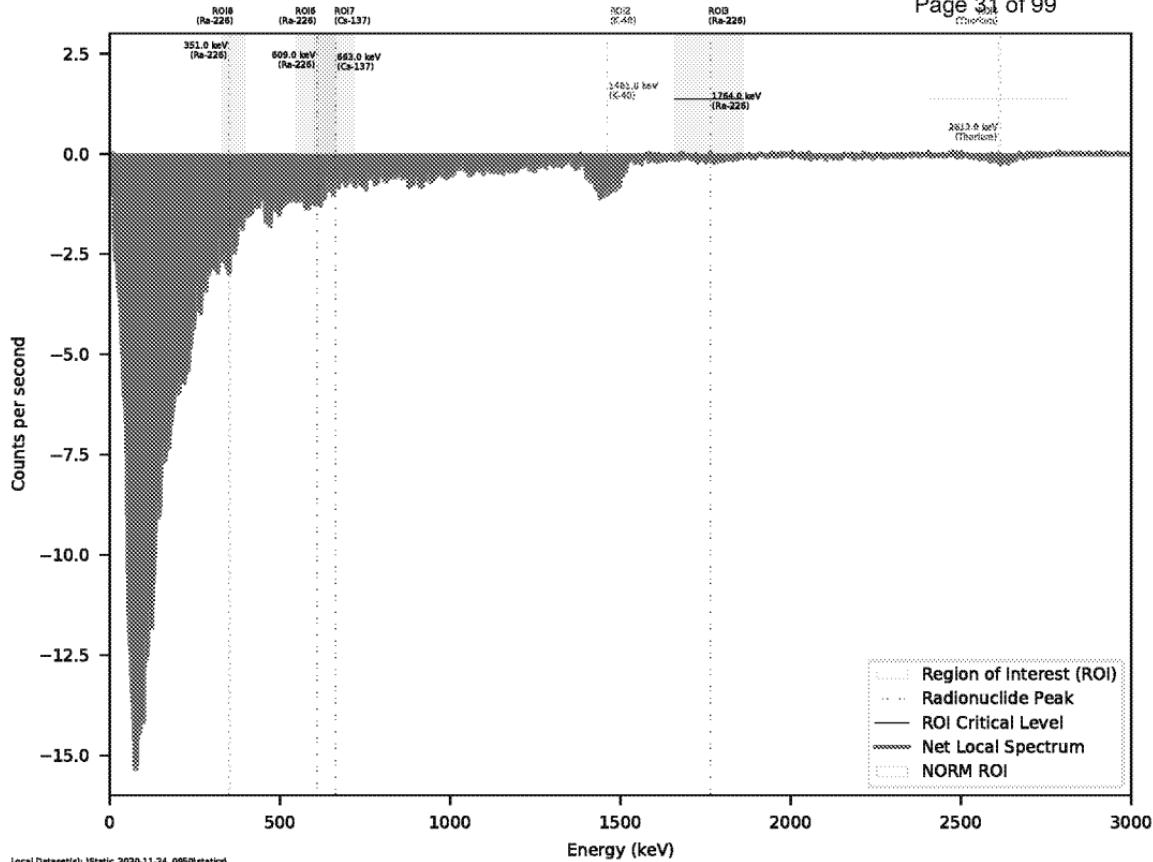
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Net Gamma Spectrum, Static Location: 18

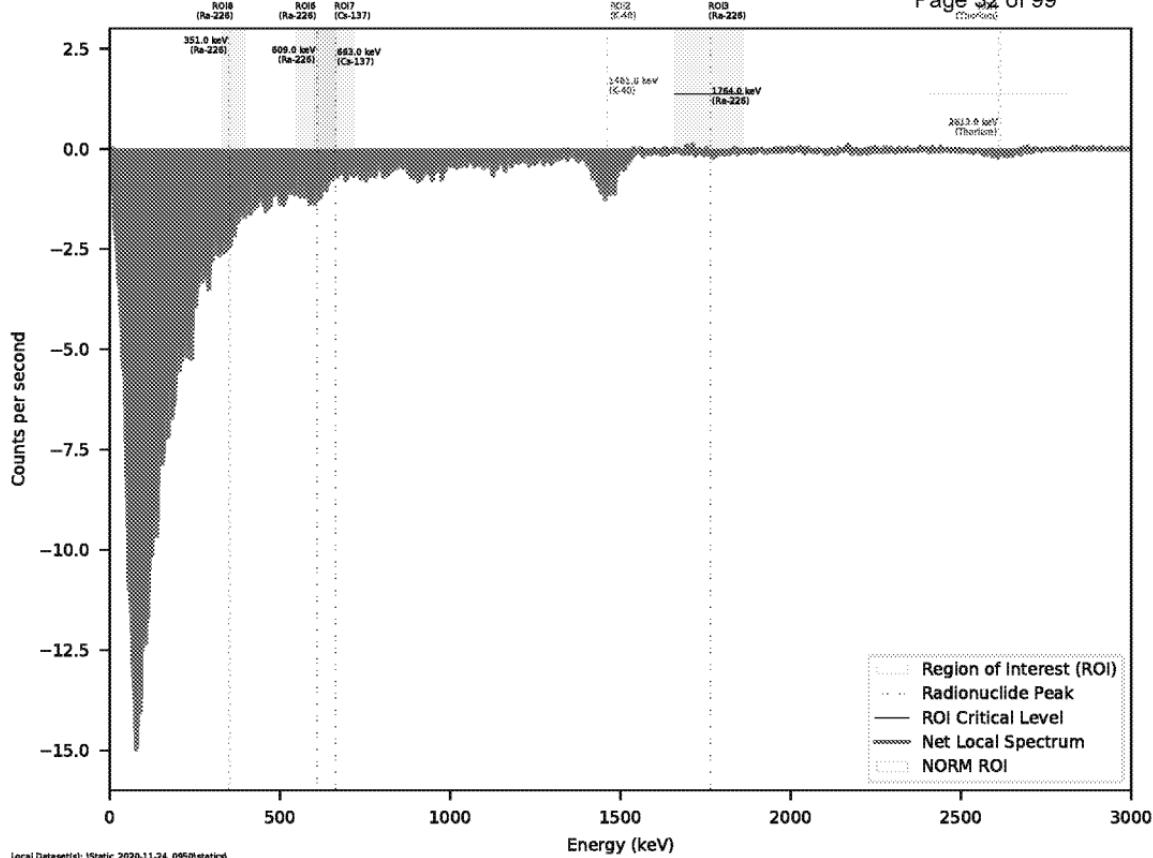
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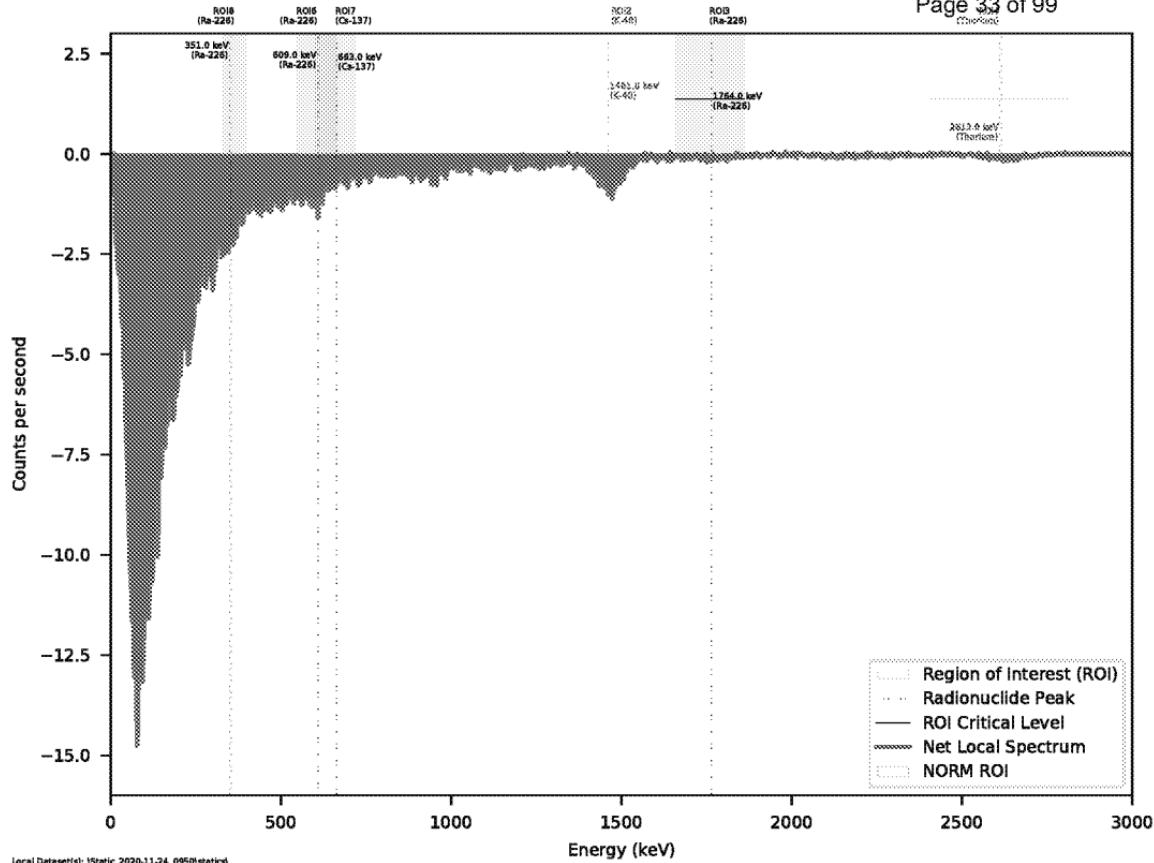
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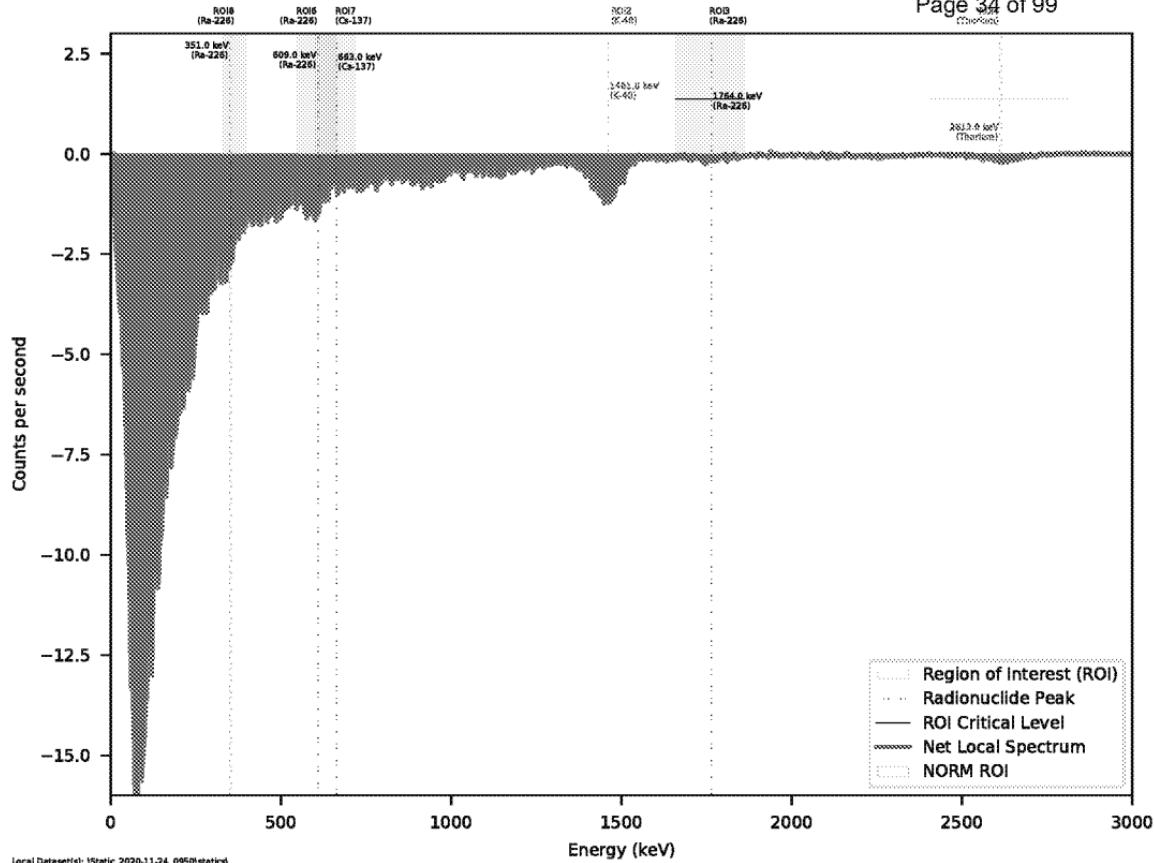
Net Gamma Spectrum, Static Location: 20

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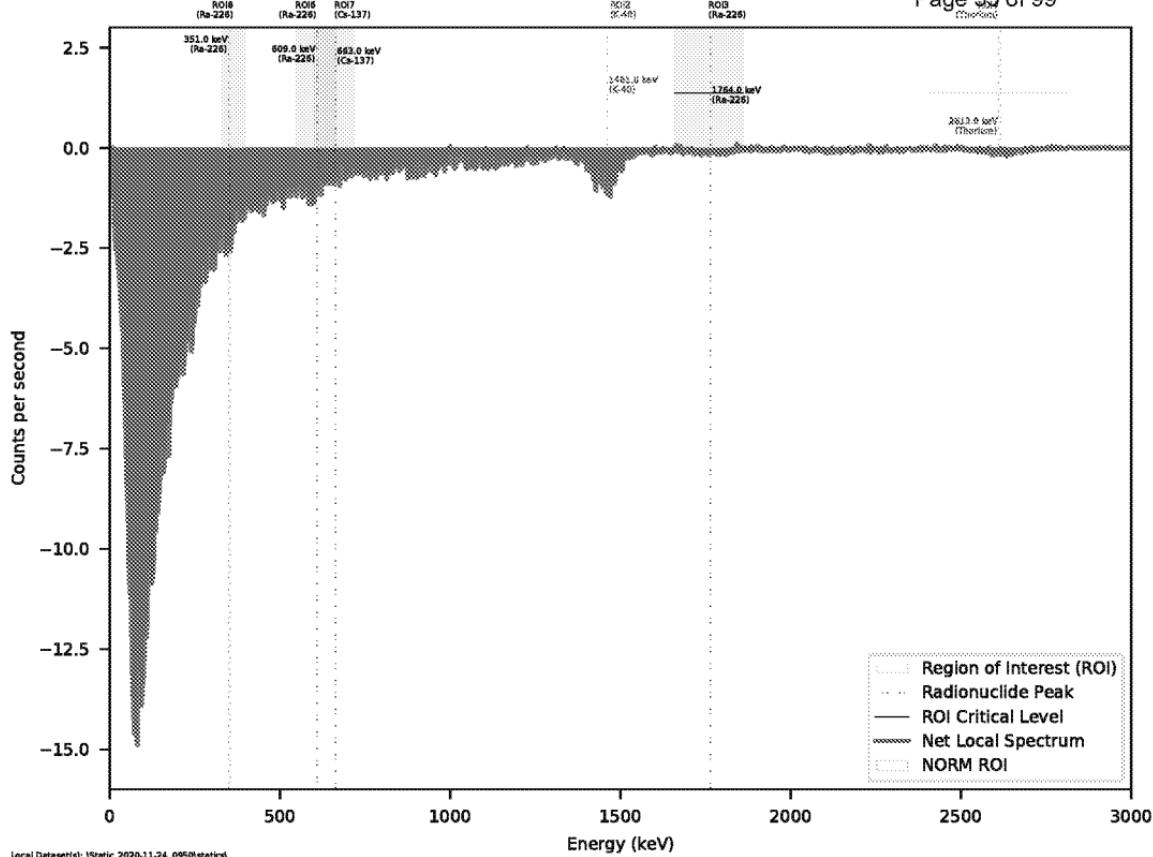
Net Gamma Spectrum, Static Location: 21

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Net Gamma Spectrum, Static Location: 22

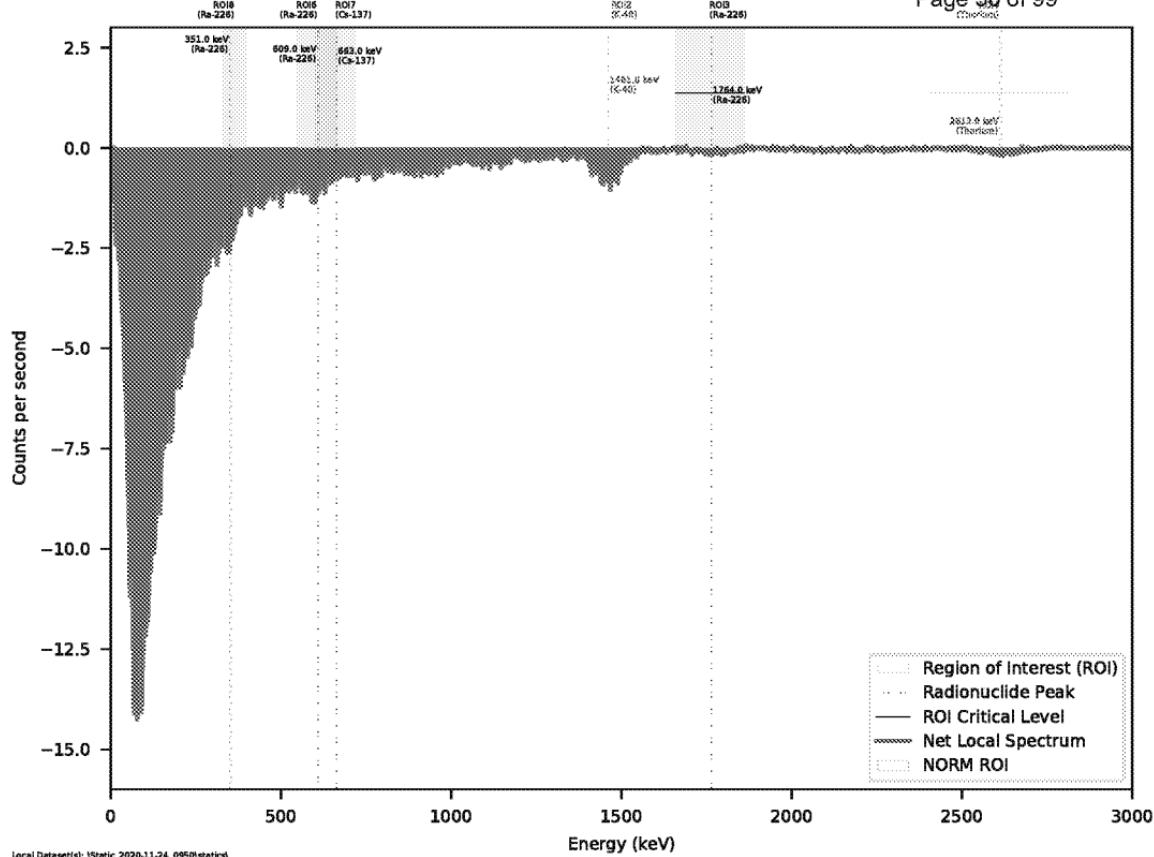
Page 35 of 99



ED_006360A_00000359-00035

Net Gamma Spectrum, Static Location: 23

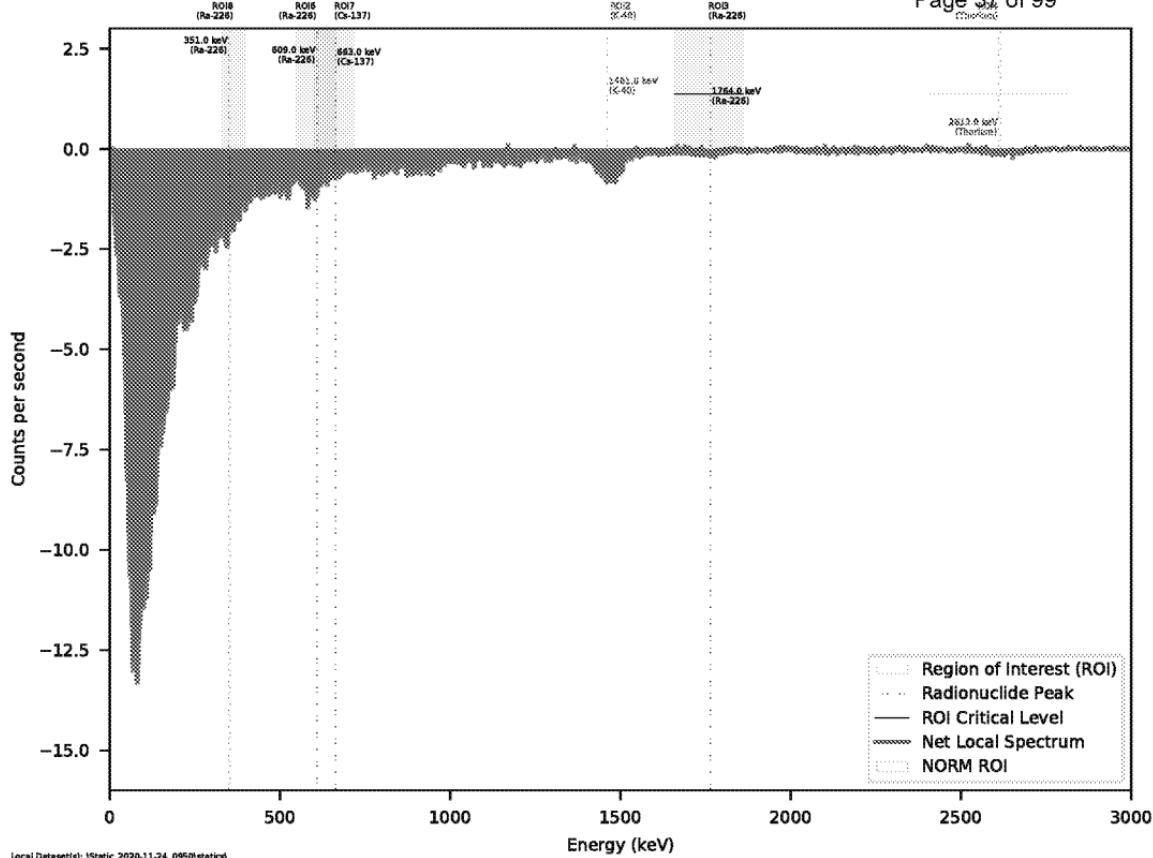
Page 36 of 99



ED_006360A_00000359-00036

Net Gamma Spectrum, Static Location: 24

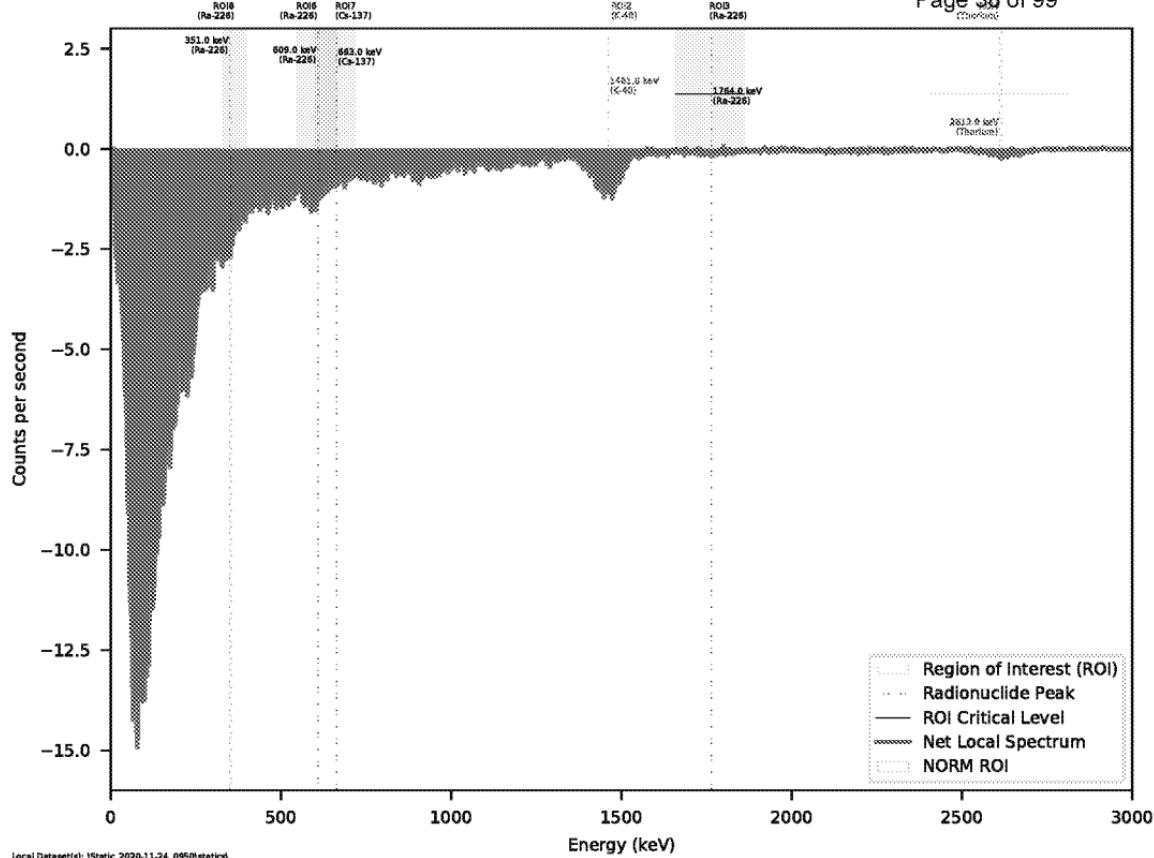
Page 37 of 99



ED_006360A_00000359-00037

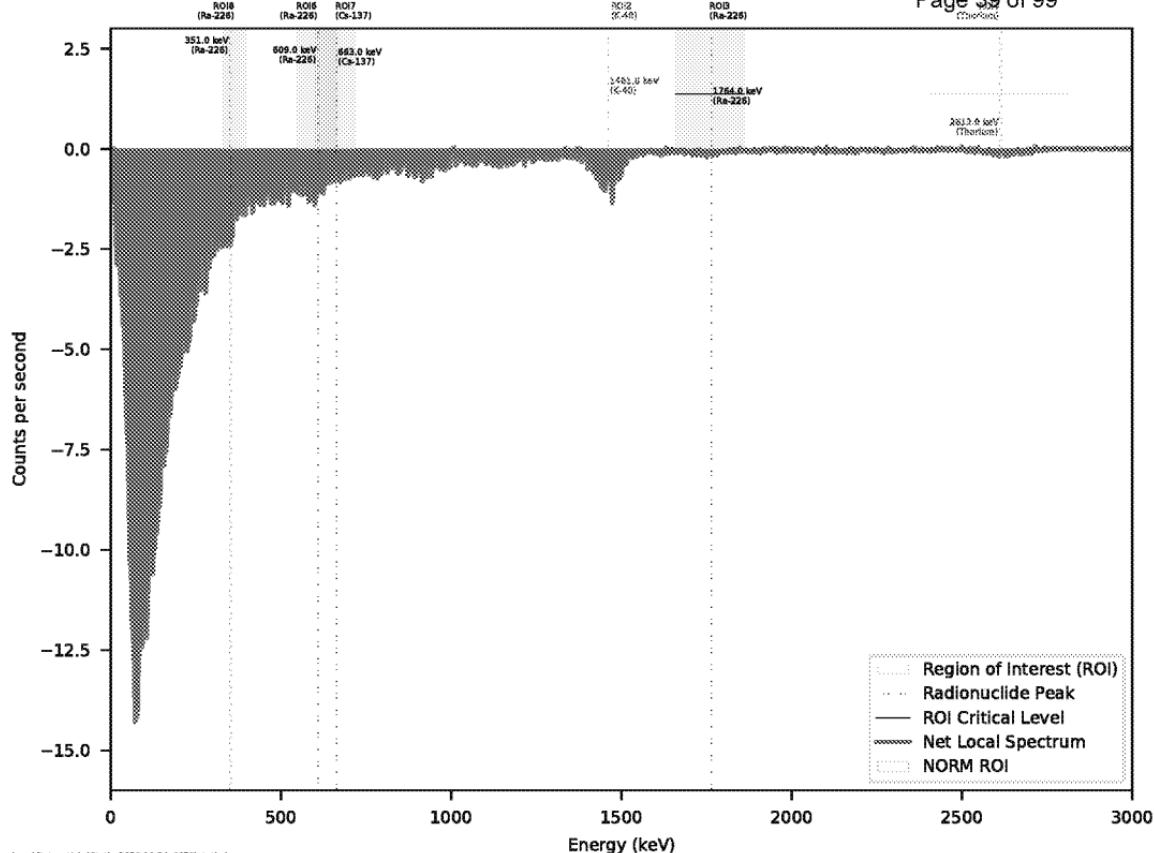
Net Gamma Spectrum, Static Location: 25

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Net Gamma Spectrum, Static Location: 26

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Environment Testing America

ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-40591-1
Laboratory Sample Delivery Group: GJ46599745
Client Project/Site: HPNS-Parcel G 501197
Revision: 3

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Rose Condit

Rhonda Ridenhower

Authorized for release by:
4/12/2021 5:17:39 PM

Rhonda Ridenhower, Client Service Manager
(314)298-8566
Rhonda.Ridenhower@Eurofinset.com

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The
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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Case Narrative

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Job ID: 160-40591-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-40591-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

The matrix for the Method Blank and LCS is as close to the following samples as can be reasonably achieved. Detailed information can be found in the most current revision of the associated SOP.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Incorrect GFPC blue monthly background, correct background and results reported in revision.

Revision 2- J flags applied to sample HPPG-317364365-SU28C-001 (160-40591-1).

Revision 3- Additional information requested in case narrative for total strontium

Case Narrative

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Job ID: 160-40591-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

RECEIPT

The samples were received on 11/27/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 15.6 C.

STRONTIUM-90 (GFPC)

Samples HPPG-317364365-SU28C-001 (160-40591-1), HPPG-317364365-SU28C-011 (160-40591-11) and HPPG-317364365-SU28C-021 (160-40591-21) were analyzed for Strontium-90 (GFPC) in accordance with EPA 905. The samples were dried on 11/30/2020 and 12/01/2020, prepared on 12/03/2020 and 12/09/2020 and analyzed on 12/14/2020 and 12/18/2020.

Strontium 90 Prep Batch 491323

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP: HPPG-317364365-SU28C-011 (160-40591-11) and HPPG-317364365-SU28C-021 (160-40591-21).

The method blank (MB) Z-score is within limits and is located in the level IV raw data. (MB 160-491323/23-A)

Strontium 90 Prep batch 490804

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP: HPPG-317364365-SU28C-001 (160-40591-1).

The method blank (MB) Z-score is within limits and is located in the level IV raw data. (MB 160-490804/22-A)

The strontium carrier recovery is outside the lower control limit (40%) for the following sample: (160-39992-A-30-D DU). The detection goal was not met for these samples due to the low carrier recovery from the presence of matrix interference apparent during the initial preparation of the sample. The QC associated with these samples fell within acceptable criteria demonstrating acceptable preparation and instrument performance. The data have been reported with this narrative.

The laboratory control sample (LCS) associated with the following samples falls below the lower limit for spike criteria (recovery is 74%; criteria is 75-125%): HPPG-317364365-SU28C-001 (160-40591-1), (160-39992-A-30-C) and (160-39992-A-30-D DU). The other QC associated with this batch (MB, RER for duplicate precision, carrier recoveries associated) fall within acceptable criteria demonstrating acceptable preparation and instrument performance. The lab does not believe the 1% lower than criteria excursion adversely affects the data. The recovery is within statistical in house limits of 59-124%. The data has been reported with this narrative by client approval.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC PLUTONIUM (ALPHA SPECTROMETRY)

Samples HPPG-317364365-SU28C-001 (160-40591-1), HPPG-317364365-SU28C-011 (160-40591-11), HPPG-317364365-SU28C-012 (160-40591-12), HPPG-317364365-SU28C-021 (160-40591-21) and HPPG-F-045 (160-40591-26) were analyzed for Isotopic Plutonium (Alpha Spectrometry) in accordance with A-01-R. The samples were dried on 11/30/2020, 12/01/2020 and 12/15/2020, prepared on 12/15/2020 and analyzed on 12/22/2020.

The method blank (MB) Z-score is within limits and is located in the level IV raw data. (MB 160-491931/1-A)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC URANIUM (ALPHA SPECTROMETRY)

Samples HPPG-317364365-SU28C-001 (160-40591-1), HPPG-317364365-SU28C-011 (160-40591-11), HPPG-317364365-SU28C-012 (160-40591-12), HPPG-317364365-SU28C-021 (160-40591-21) and HPPG-F-045 (160-40591-26) were analyzed for Isotopic Uranium (Alpha Spectrometry) in accordance with DOE. The samples were dried on 11/30/2020, 12/01/2020 and 12/15/2020, prepared on 12/15/2020 and analyzed on 12/22/2020.

The method blank (MB) Z-score is within limits and is located in the level IV raw data. (MB 160-491935/1-A)

Detectors 179 and 182 were calibrated on 12/11 therefore no monthly calibration verification (CCV) is needed.(LCS 160-491935/2-A) and

Case Narrative

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Job ID: 160-40591-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

(MB 160-491935/1-A)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples HPPG-317364365-SU28C-001 (160-40591-1), HPPG-317364365-SU28C-002 (160-40591-2), HPPG-317364365-SU28C-003 (160-40591-3), HPPG-317364365-SU28C-004 (160-40591-4), HPPG-317364365-SU28C-005 (160-40591-5), HPPG-317364365-SU28C-006 (160-40591-6), HPPG-317364365-SU28C-007 (160-40591-7), HPPG-317364365-SU28C-008 (160-40591-8), HPPG-317364365-SU28C-009 (160-40591-9), HPPG-317364365-SU28C-010 (160-40591-10), HPPG-317364365-SU28C-011 (160-40591-11), HPPG-317364365-SU28C-012 (160-40591-12), HPPG-317364365-SU28C-013 (160-40591-13), HPPG-317364365-SU28C-014 (160-40591-14), HPPG-317364365-SU28C-015 (160-40591-15), HPPG-317364365-SU28C-016 (160-40591-16), HPPG-317364365-SU28C-017 (160-40591-17), HPPG-317364365-SU28C-018 (160-40591-18), HPPG-317364365-SU28C-019 (160-40591-19), HPPG-317364365-SU28C-020 (160-40591-20), HPPG-317364365-SU28C-021 (160-40591-21), HPPG-317364365-SU28C-022 (160-40591-22), HPPG-317364365-SU28C-023 (160-40591-23), HPPG-317364365-SU28C-024 (160-40591-24), HPPG-317364365-SU28C-025 (160-40591-25), HPPG-F-045 (160-40591-26) and HPPG-F-046 (160-40591-27) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 11/30/2020 and 12/01/2020, prepared on 12/03/2020 and 12/04/2020 and analyzed on 12/24/2020 and 12/25/2020.

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from Reported to Analyte

Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

Gamma prep batch 490802

The method blank (MB) z-score associated with Prep Batch 160-490802 is within limits and is stored in the level IV raw data. (MB 160-490802/1-A)

Gamma prep batch 490932

The method blank (MB) z-score associated with Prep Batch 160-490932 is within limits and is stored in the level IV raw data. (MB 160-490932/1-A)

The following sample exhibited a negative result greater in magnitude than the 3 sigma TPU (40591-24; Co-60 and 40596-21; Pb-210); HPPG-317364365-SU28C-024 (160-40591-24). This occurrence was evaluated and determined to be random in nature. Sporadic

Case Narrative

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Job ID: 160-40591-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

occurrences such as this are statistically expected. No further action is required.

Gamma prep batch 490911

The method blank (MB) z-score associated with Prep Batch 160-490911 is within limits and is stored in the level IV raw data. (MB 160-490911/1-A)

The radium-226 detection goal of 0.200 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline. The method blank activity is below the DLC and RL. (MB 160-490911/1-A)

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline.

HPPG-317364365-SU28C-013 (160-40591-13)

The following sample exhibited a negative result greater in magnitude than the 3 sigma TPU for Pb-210: HPPG-317364365-SU28C-023 (160-40591-23). This occurrence was evaluated and determined to be random in nature. Sporadic occurrences such as this are statistically expected. No further action is required.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.



CHAIN OF CUSTODY

Ref. Document # 501197RSY-041

Page 1 of 4

APTIM Federal Services, LLC

4005 Port Chicago Hwy
Concord, CA 94520Project Manager: Lisa Bercik
Phone #: (619)213-3389Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy

Sample Lead: Lewis, Devin

Sample Tech(s): Andrew Murn
Paul LeBlanc

				Project Number: 501197		Analysis Requested							
				Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action									
				Project Location: San Francisco, CA									
				Purchase Order #: 1159058									
				Shipment/Pickup Date: 11/25/2020									
				Waybill Number: 4957 0225 6181									
				Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046									
				Lab Contact Name/ph #		Rhoeda Ridenbower (314)298-8566							
						Cadmium Spec (EPA 901.1N) - Full 21 day ingrowth gamma							
						Strontium-90 (EP-A 905 MDD)							
						Ra-226 by Alpha spec, Isotopic U (234, 235, 238)							
						U-238 by Alpha spec, Isotopic U (234, 238)							
						Dose Rate uR/Hr							
						Evidence Bag ID							
												Comment	



CHAIN OF CUSTODY

APTIM Federal Services, LLC

4005 Port Chicago Hwy
Concord, CA 94520Project Manager: Lisa Bercik
Phone #: (619)213-3389Send Report to: Rose Condit
Phone/Fax Number: 415-987-0780
Address: 4005 Port Chicago Hwy
City: Concord, CA 94520

Sample Lead: Lewis, Devin

Sample Tech(s): Andrew Murri
Paul LeBlanc

Project Number: 501197

Hunters Point Naval Shipyard: Parcel
Project Name: G Remedial Action

Project Location: San Francisco, CA

Purchase Order #: 1189058

Shipment/Pickup Date: 11/25/2020

Waybill Number: 495702256181

Test America (St. Louis Lab)
13715 Rider Trail North
Earth City, MO 63046

Lab Contact Name/ph #

Rhoeda Ridenbower (314)298-8566

Ref. Document # 501197RSY-041

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	Collection Information	Analysis Requested										Comment	
		Preservatives (water)	Preservatives (soil)	Container Type	# of Containers	Matrix	Day in Growth Genome	Strontium-90 (EPA 905 M0D)	Ra-226 by Alpha spec, Isotopic U(234, 228/6, 238)	Uranium Spec (EPA 901, 1, M)- Full 21	Isotope Pu (238, 239/240)	Dose Rate $\mu\text{R}/\text{Hr}$	Evidence Bag ID
		SO	1	16 oz. plastic jar	X								
HPPG-317364365-SU28C-009	11/23/2020	15:13	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-010	11/23/2020	15:15	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-011	11/23/2020	15:17	G	SO	1	16 oz. plastic jar	X	X	X	X	4	GJ46599745	
HPPG-317364365-SU28C-012	11/23/2020	15:18	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-013	11/23/2020	15:21	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-014	11/23/2020	15:20	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-015	11/23/2020	15:23	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-016	11/23/2020	15:24	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-017	11/23/2020	15:27	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-018	11/23/2020	15:29	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-019	11/23/2020	15:31	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-020	11/23/2020	15:33	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-021	11/23/2020	15:35	G	SO	1	16 oz. plastic jar	X	X	X	X	4	GJ46599745	
HPPG-317364365-SU28C-022	11/23/2020	15:38	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-023	11/23/2020	15:41	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-024	11/23/2020	15:43	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	
HPPG-317364365-SU28C-025	11/23/2020	15:47	G	SO	1	16 oz. plastic jar	X				4	GJ46599745	



CHAIN OF CUSTODY

Ref. Document # 501197RSY-041

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APTIM Federal Services, LLC

4005 Port Chicago Hwy
Concord, CA 94520Project Manager: Lisa Berck
Phone #: (619)213-3389Send Report to: Rose Condit
Phone/Fax Number: 415-987-0780
Address: 4005 Port Chicago Hwy
City: Concord, CA 94520

Sample Lead: Lewis, Devin

Sample Tech(s): Andrew Murri
Paul LeBlanc

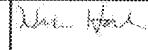
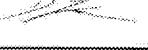
				Analysis Requested						
				Preservatives (water)						
				Preservatives (soil)						
Sample ID	Date	Time	Method	Metric	# of Containers	Container Type	Preservative Type	Storage Spec (EPA 905 WOD)	Isootope Pu (238, 239240)	Dose Rate μ R/Hr
HPPG-F-045	11/23/2020	15:18	G	OS	1	16 oz. plastic jar	X	238/239 by Alpha spec Isotopic U(234, 238/239)		4
HPPG-F-046	11/23/2020	15:27	G	OS	1	16 oz. plastic jar	X	238/239 by Alpha spec Isotopic U(234, 238/239)		4



All Transfers for COC 501197RSY-041

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Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		11/23/2020 17:07	Locked Storage(Kevin Hoch)		11/23/2020 17:07
Locked Storage(Kevin Hoch)		11/25/2020 07:37	Devin Lewis		11/25/2020 07:37
Devin Lewis		11/25/2020 11:08	SHIPPEDTO:LAB	 MICHA KORRIN HITZ	11/25/2020 09:12



Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40591-1
SDG Number: GJ46599745**Login Number:** 40591**List Source:** Eurofins TestAmerica, St. Louis**List Number:** 1**Creator:** Greer, Diane A

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

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Job ID: 160-40591-1
SDG: GJ46599745

Qualifiers

Rad Qualifier	Qualifier Description
J	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
%	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

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Job ID: 160-40591-1
SDG: GJ46599745

Method	Method Description	Protocol	Laboratory
905	Strontium-90 (GFPC)	EPA	TAL SL
A-01-R	Isotopic Plutonium and Neptunium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Uranium (Alpha Spectrometry)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-7	Preparation, Digestion/Precipitate Separation (7-Day In-Growth)	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy

EPA = US Environmental Protection Agency

None = None

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Eurofins TestAmerica, St. Louis

Sample Summary

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40591-1	HPPG-317364365-SU28C-001	Solid	11/23/20 15:02	11/27/20 09:12	
160-40591-2	HPPG-317364365-SU28C-002	Solid	11/23/20 15:03	11/27/20 09:12	
160-40591-3	HPPG-317364365-SU28C-003	Solid	11/23/20 15:05	11/27/20 09:12	
160-40591-4	HPPG-317364365-SU28C-004	Solid	11/23/20 15:07	11/27/20 09:12	
160-40591-5	HPPG-317364365-SU28C-005	Solid	11/23/20 15:08	11/27/20 09:12	
160-40591-6	HPPG-317364365-SU28C-006	Solid	11/23/20 15:10	11/27/20 09:12	
160-40591-7	HPPG-317364365-SU28C-007	Solid	11/23/20 15:08	11/27/20 09:12	
160-40591-8	HPPG-317364365-SU28C-008	Solid	11/23/20 15:11	11/27/20 09:12	
160-40591-9	HPPG-317364365-SU28C-009	Solid	11/23/20 15:13	11/27/20 09:12	
160-40591-10	HPPG-317364365-SU28C-010	Solid	11/23/20 15:15	11/27/20 09:12	
160-40591-11	HPPG-317364365-SU28C-011	Solid	11/23/20 15:17	11/27/20 09:12	
160-40591-12	HPPG-317364365-SU28C-012	Solid	11/23/20 15:18	11/27/20 09:12	
160-40591-13	HPPG-317364365-SU28C-013	Solid	11/23/20 15:21	11/27/20 09:12	
160-40591-14	HPPG-317364365-SU28C-014	Solid	11/23/20 15:20	11/27/20 09:12	
160-40591-15	HPPG-317364365-SU28C-015	Solid	11/23/20 15:23	11/27/20 09:12	
160-40591-16	HPPG-317364365-SU28C-016	Solid	11/23/20 15:24	11/27/20 09:12	
160-40591-17	HPPG-317364365-SU28C-017	Solid	11/23/20 15:27	11/27/20 09:12	
160-40591-18	HPPG-317364365-SU28C-018	Solid	11/23/20 15:29	11/27/20 09:12	
160-40591-19	HPPG-317364365-SU28C-019	Solid	11/23/20 15:31	11/27/20 09:12	
160-40591-20	HPPG-317364365-SU28C-020	Solid	11/23/20 15:33	11/27/20 09:12	
160-40591-21	HPPG-317364365-SU28C-021	Solid	11/23/20 15:35	11/27/20 09:12	
160-40591-22	HPPG-317364365-SU28C-022	Solid	11/23/20 15:38	11/27/20 09:12	
160-40591-23	HPPG-317364365-SU28C-023	Solid	11/23/20 15:41	11/27/20 09:12	
160-40591-24	HPPG-317364365-SU28C-024	Solid	11/23/20 15:43	11/27/20 09:12	
160-40591-25	HPPG-317364365-SU28C-025	Solid	11/23/20 15:47	11/27/20 09:12	
160-40591-26	HPPG-F-045	Solid	11/23/20 15:18	11/27/20 09:12	
160-40591-27	HPPG-F-046	Solid	11/23/20 15:27	11/27/20 09:12	

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Client Sample Results

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 Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

 Job ID: 160-40591-1
 SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-001
Lab Sample ID: 160-40591-1

Date Collected: 11/23/20 15:02

Matrix: Solid

Date Received: 11/27/20 09:12

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Strontium-90	0.0775	U J	0.152	0.153	0.331	0.119	pCi/g	12/03/20 11:35	12/14/20 17:12	1
Carrier										
Sr Carrier	103	U	Limits		40 - 110					
Y Carrier	91.6	U	Limits		40 - 110					

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Plutonium-238	0.00193	U	0.00864	0.00864	0.100	0.00636	pCi/g	12/15/20 12:44	12/22/20 11:15	1
Plutonium-239/240	-0.00193	U	0.00865	0.00865	0.100	0.00779	pCi/g	12/15/20 12:44	12/22/20 11:15	1
Tracer										
Pu-242 (T)	86.9	U	Limits		30 - 110					

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Uranium-234	0.361	U	0.0553	0.0631	0.250	0.0121	pCi/g	12/15/20 13:10	12/22/20 11:09	1
Uranium-235/236	0.0172	U	0.0163	0.0163	0.100	0.00807	pCi/g	12/15/20 13:10	12/22/20 11:09	1
Uranium-238	0.324	U	0.0508	0.0577	0.250	0.00458	pCi/g	12/15/20 13:10	12/22/20 11:09	1
Tracer										
Uranium-232	90.0	U	Limits		30 - 110					

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.277	U	0.127	0.130	0.0364	0.0364	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Actinium-227	-0.0900	U	0.566	0.566	0.348	0.348	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Bismuth-212	0.344	U	0.648	0.649	0.487	0.487	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Bismuth-214	-0.00645	U	0.00809	0.00812	0.113	0.113	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Cesium-137	-0.00666	U	0.0541	0.0541	0.0700	0.0451	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Lead-210	-0.237	U	1.24	1.24	0.891	0.891	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Lead-212	0.242	U	0.0711	0.0777	0.0340	0.0340	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Lead-214	0.226	U	0.0957	0.0985	0.0570	0.0570	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Potassium-40	6.14	U	1.28	1.43	0.248	0.248	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Protactinium-231	0.251	U	1.40	1.40	1.13	1.13	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Protactinium-234	0.110	U	0.0984	0.0990	0.129	0.129	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Radium-226	-0.00645	U	0.00809	0.00812	0.200	0.113	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Radium-228	0.277	U	0.127	0.130	0.0364	0.0364	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Thallium-208	0.0976	U	0.0419	0.0431	0.0138	0.0138	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Thorium 228	0.242	U	0.0711	0.0777	0.0340	0.0340	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Thorium-232	0.277	U	0.127	0.130	0.0364	0.0364	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Thorium-234	-0.145	U	0.441	0.442	0.371	0.371	pCi/g	12/03/20 11:24	12/24/20 10:56	1
Uranium-235	-0.00923	U	0.237	0.237	0.223	0.223	pCi/g	12/03/20 11:24	12/24/20 10:56	1

Eurofins TestAmerica, St. Louis

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

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Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-001

Lab Sample ID: 160-40591-1

Date Collected: 11/23/20 15:02

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Uranium-238	-0.145	U	0.441	0.442		0.371	pCi/g	12/03/20 11:24	12/24/20 10:56	1

Client Sample ID: HPPG-317364365-SU28C-002

Lab Sample ID: 160-40591-2

Date Collected: 11/23/20 15:03

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.446		0.219	0.225		0.0774	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Actinium-227	-0.393	U	0.649	0.650		0.441	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Bismuth-212	-0.505	U	1.03	1.04		0.812	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Bismuth-214	0.364		0.167	0.172		0.0689	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Cesium-137	0.0403	U	0.0726	0.0728	0.0700	0.0560	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Lead-210	0.587	U	1.55	1.55		1.04	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Lead-212	0.385		0.0990	0.109		0.0537	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Lead-214	0.415		0.128	0.136		0.0534	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Potassium-40	8.70		1.47	1.78		0.306	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Protactinium-231	-0.889	U	2.81	2.81		2.28	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Protactinium-234	0.00782	U	0.0120	0.0120		0.291	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Radium-226	0.364		0.167	0.172	0.200	0.0689	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Radium-228	0.446		0.219	0.225		0.0774	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Thallium-208	0.182		0.0650	0.0683		0.0237	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Thorium 228	0.385		0.0990	0.109		0.0537	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Thorium-232	0.446		0.219	0.225		0.0774	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Thorium-234	-1.04	U	0.905	0.914		0.968	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Uranium-235	-0.0335	U	0.0490	0.0492		0.493	pCi/g	12/03/20 11:24	12/24/20 11:14	1
Uranium-238	-1.04	U	0.905	0.914		0.968	pCi/g	12/03/20 11:24	12/24/20 11:14	1

Client Sample ID: HPPG-317364365-SU28C-003

Lab Sample ID: 160-40591-3

Date Collected: 11/23/20 15:05

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.253		0.121	0.124		0.0447	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Actinium-227	0.223		0.241	0.242		0.174	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Bismuth-212	0.0139	U	0.513	0.513		0.421	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Bismuth-214	0.194		0.0784	0.0809		0.0385	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Cesium-137	0.0177	U	0.0342	0.0343	0.0700	0.0262	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Lead-210	0.401	U	0.907	0.908		0.723	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Lead-212	0.314		0.0914	0.100		0.0617	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Lead-214	0.102		0.0414	0.0427		0.0807	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Potassium-40	7.45		1.01	1.26		0.0789	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Protactinium-231	-0.604	U	1.85	1.85		1.50	pCi/g	12/03/20 11:24	12/24/20 11:16	1

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Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-003
Date Collected: 11/23/20 15:05
Date Received: 11/27/20 09:12

Lab Sample ID: 160-40591-3
Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Protactinium-234	0.000744	U	0.00130	0.00130		0.185	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Radium-226	0.194		0.0784	0.0809	0.200	0.0385	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Radium-228	0.253		0.121	0.124		0.0447	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Thallium-208	0.113		0.0309	0.0330		0.00489	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Thorium 228	0.314		0.0914	0.100		0.0617	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Thorium-232	0.253		0.121	0.124		0.0447	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Thorium-234	0.170	U	0.360	0.360		0.649	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Uranium-235	0.0350	U	0.222	0.222		0.325	pCi/g	12/03/20 11:24	12/24/20 11:16	1
Uranium-238	0.170	U	0.360	0.360		0.649	pCi/g	12/03/20 11:24	12/24/20 11:16	1

Client Sample ID: HPPG-317364365-SU28C-004

Date Collected: 11/23/20 15:07
Date Received: 11/27/20 09:12

Lab Sample ID: 160-40591-4

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.227		0.157	0.159		0.0624	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Actinium-227	-0.257	U	0.634	0.635		0.385	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Bismuth-212	-0.470	U	0.807	0.808		0.626	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Bismuth-214	0.344		0.109	0.115		0.0469	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Cesium-137	-0.0237	U	0.0525	0.0526	0.0700	0.0408	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Lead-210	1.29		1.46	1.47		0.906	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Lead-212	0.217		0.0729	0.0764		0.0425	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Lead-214	0.374		0.0894	0.0971		0.0508	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Potassium-40	7.94		1.21	1.45		0.108	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Protactinium-231	0.000	U	0.335	0.335		1.97	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Protactinium-234	0.0122	U	0.0238	0.0238		0.241	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Radium-226	0.344		0.109	0.115	0.200	0.0469	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Radium-228	0.227		0.157	0.159		0.0624	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Thallium-208	0.119		0.0744	0.0754		0.0288	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Thorium 228	0.217		0.0729	0.0764		0.0425	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Thorium-232	0.227		0.157	0.159		0.0624	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Thorium-234	0.606		0.589	0.593		0.355	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Uranium-235	-0.00814	U	0.537	0.537		0.442	pCi/g	12/03/20 11:24	12/24/20 11:54	1
Uranium-238	0.606		0.589	0.593		0.355	pCi/g	12/03/20 11:24	12/24/20 11:54	1

Client Sample ID: HPPG-317364365-SU28C-005

Date Collected: 11/23/20 15:08
Date Received: 11/27/20 09:12

Lab Sample ID: 160-40591-5

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.331		0.125	0.129		0.0924	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Actinium-227	0.145	U	0.241	0.241		0.205	pCi/g	12/03/20 11:24	12/24/20 11:55	1

Eurofins TestAmerica, St. Louis

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

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Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-005

Lab Sample ID: 160-40591-5

Date Collected: 11/23/20 15:08

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Bismuth-212	0.199	U	0.451	0.451		0.350	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Bismuth-214	0.336		0.0878	0.0945		0.0318	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Cesium-137	0.00411	U	0.0322	0.0322	0.0700	0.0260	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Lead-210	-0.542	U	1.01	1.01		0.800	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Lead-212	0.264		0.0601	0.0691		0.0289	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Lead-214	0.364		0.0872	0.0951		0.0396	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Potassium-40	7.71		1.08	1.34		0.232	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Protactinium-231	-0.707	U	2.19	2.19		1.78	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Protactinium-234	-0.00202	U	0.00412	0.00413		0.179	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Radium-226	0.336		0.0878	0.0945	0.200	0.0318	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Radium-228	0.331		0.125	0.129		0.0924	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Thallium-208	0.124		0.0385	0.0406		0.0133	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Thorium 228	0.264		0.0601	0.0691		0.0289	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Thorium-232	0.331		0.125	0.129		0.0924	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Thorium-234	0.000	U	0.287	0.287		0.725	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Uranium-235	0.000	U	0.140	0.140		0.327	pCi/g	12/03/20 11:24	12/24/20 11:55	1
Uranium-238	0.000	U	0.287	0.287		0.725	pCi/g	12/03/20 11:24	12/24/20 11:55	1

Client Sample ID: HPPG-317364365-SU28C-006

Lab Sample ID: 160-40591-6

Date Collected: 11/23/20 15:10

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.134		0.176	0.177		0.117	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Actinium-227	0.264	U	0.517	0.518		0.308	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Bismuth-212	0.000	U	0.572	0.572		0.606	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Bismuth-214	0.444		0.118	0.127		0.0447	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Cesium-137	-0.00561	U	0.0579	0.0579	0.0700	0.0471	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Lead-210	0.778	U	1.17	1.18		0.827	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Lead-212	0.398		0.0874	0.0967		0.0408	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Lead-214	0.427		0.106	0.114		0.0422	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Potassium-40	8.22		1.28	1.53		0.117	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Protactinium-231	0.696	U	2.37	2.37		1.92	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Protactinium-234	0.119	U	0.237	0.237		0.230	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Radium-226	0.444		0.118	0.127	0.200	0.0447	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Radium-228	0.134		0.176	0.177		0.117	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Thallium-208	0.0928		0.0791	0.0796		0.0348	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Thorium 228	0.398		0.0874	0.0967		0.0408	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Thorium-232	0.134		0.176	0.177		0.117	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Thorium-234	0.808		0.612	0.618		0.406	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Uranium-235	0.00643	U	0.350	0.350		0.288	pCi/g	12/04/20 10:34	12/25/20 11:17	1
Uranium-238	0.808		0.612	0.618		0.406	pCi/g	12/04/20 10:34	12/25/20 11:17	1

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Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-007

Lab Sample ID: 160-40591-7

Matrix: Solid

Date Collected: 11/23/20 15:08
Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.203		0.0824	0.0850		0.113	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Actinium-227	-0.0242	U	0.0962	0.0963		0.270	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Bismuth-212	0.279	U	0.465	0.466		0.354	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Bismuth-214	0.285		0.0981	0.102		0.0429	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Cesium-137	-0.0251	U	0.0497	0.0498	0.0700	0.0389	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Lead-210	0.509	U	0.962	0.963		0.763	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Lead-212	0.323		0.0632	0.0758		0.0270	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Lead-214	0.266		0.0789	0.0836		0.0358	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Potassium-40	7.74		1.04	1.31		0.0812	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Protactinium-231	0.000	U	0.223	0.223		1.59	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Protactinium-234	0.164		0.109	0.111		0.0478	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Radium-226	0.285		0.0981	0.102	0.200	0.0429	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Radium-228	0.203		0.0824	0.0850		0.113	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Thallium-208	0.101		0.0383	0.0397		0.0114	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Thorium 228	0.323		0.0632	0.0758		0.0270	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Thorium-232	0.203		0.0824	0.0850		0.113	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Thorium-234	-0.104	U	0.304	0.304		0.684	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Uranium-235	0.120	U	0.260	0.261		0.243	pCi/g	12/04/20 10:34	12/25/20 11:19	1
Uranium-238	-0.104	U	0.304	0.304		0.684	pCi/g	12/04/20 10:34	12/25/20 11:19	1

Client Sample ID: HPPG-317364365-SU28C-008

Lab Sample ID: 160-40591-8

Matrix: Solid

Date Collected: 11/23/20 15:11
Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.258		0.185	0.187		0.164	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Actinium-227	0.143	U	0.481	0.481		0.349	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Bismuth-212	-0.0511	U	0.715	0.715		0.583	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Bismuth-214	0.413		0.140	0.148		0.0558	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Cesium-137	0.0311	U	0.0668	0.0669	0.0700	0.0517	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Lead-210	1.10	U	1.69	1.70		1.13	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Lead-212	0.287		0.0924	0.0984		0.0530	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Lead-214	0.472		0.131	0.142		0.0677	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Potassium-40	8.03		1.46	1.73		0.323	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Protactinium-231	0.529	U	2.16	2.16		2.50	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Protactinium-234	-0.0405	U	0.125	0.125		0.308	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Radium-226	0.413		0.140	0.148	0.200	0.0558	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Radium-228	0.258		0.185	0.187		0.164	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Thallium-208	0.0963		0.107	0.108		0.0528	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Thorium 228	0.287		0.0924	0.0984		0.0530	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Thorium-232	0.258		0.185	0.187		0.164	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Thorium-234	0.861		0.738	0.746		0.457	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Uranium-235	0.100	U	0.0831	0.0839		0.538	pCi/g	12/04/20 10:34	12/25/20 11:21	1
Uranium-238	0.861		0.738	0.746		0.457	pCi/g	12/04/20 10:34	12/25/20 11:21	1

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Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-009

Lab Sample ID: 160-40591-9

Date Collected: 11/23/20 15:13

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.363		0.126	0.131		0.0241	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Actinium-227	0.0830	U	0.296	0.296		0.308	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Bismuth-212	0.0458	U	0.588	0.588		0.480	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Bismuth-214	0.314		0.0883	0.0941		0.0220	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Cesium-137	0.0138	U	0.0363	0.0364	0.0700	0.0282	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Lead-210	-0.635	U	1.20	1.20		1.01	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Lead-212	0.222		0.0686	0.0744		0.0396	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Lead-214	0.298		0.0846	0.0901		0.0411	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Potassium-40	5.32		1.10	1.22		0.349	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Protactinium-231	0.463	U	1.43	1.43		1.57	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Protactinium-234	-0.00162	U	0.00396	0.00396		0.148	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Radium-226	0.314		0.0883	0.0941	0.200	0.0220	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Radium-228	0.363		0.126	0.131		0.0241	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Thallium-208	0.128		0.0452	0.0471		0.0173	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Thorium 228	0.222		0.0686	0.0744		0.0396	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Thorium-232	0.363		0.126	0.131		0.0241	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Thorium-234	0.430		0.498	0.500		0.276	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Uranium-235	0.101	U	0.176	0.177		0.199	pCi/g	12/04/20 10:34	12/25/20 11:22	1
Uranium-238	0.430		0.498	0.500		0.276	pCi/g	12/04/20 10:34	12/25/20 11:22	1

Client Sample ID: HPPG-317364365-SU28C-010

Lab Sample ID: 160-40591-10

Date Collected: 11/23/20 15:15

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.292		0.148	0.151		0.107	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Actinium-227	0.0564	U	0.259	0.259		0.284	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Bismuth-212	-0.0277	U	0.571	0.571		0.514	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Bismuth-214	0.262		0.0980	0.102		0.0442	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Cesium-137	0.00663	U	0.0397	0.0397	0.0700	0.0320	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Lead-210	1.25		0.805	0.818		0.567	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Lead-212	0.255		0.0608	0.0691		0.0296	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Lead-214	0.295		0.0986	0.103		0.0438	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Potassium-40	8.60		1.16	1.46		0.241	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Protactinium-231	0.0000001	U	2.34	2.34		1.93	pCi/g	12/04/20 10:34	12/25/20 11:16	1
	58									
Protactinium-234	0.00935	U	0.0166	0.0167		0.169	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Radium-226	0.262		0.0980	0.102	0.200	0.0442	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Radium-228	0.292		0.148	0.151		0.107	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Thallium-208	0.0734		0.0505	0.0510		0.0249	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Thorium 228	0.255		0.0608	0.0691		0.0296	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Thorium-232	0.292		0.148	0.151		0.107	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Thorium-234	-0.0489	U	0.217	0.217		0.711	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Uranium-235	0.0752	U	0.155	0.156		0.280	pCi/g	12/04/20 10:34	12/25/20 11:16	1
Uranium-238	-0.0489	U	0.217	0.217		0.711	pCi/g	12/04/20 10:34	12/25/20 11:16	1

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Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-011

Lab Sample ID: 160-40591-11

Matrix: Solid

Date Collected: 11/23/20 15:17
Date Received: 11/27/20 09:12

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Strontium-90	0.0220	U	0.176	0.176	0.331	0.143	pCi/g	12/09/20 18:42	12/18/20 20:16	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	96.8		40 - 110					12/09/20 18:42	12/18/20 20:16	1
Y Carrier	92.7		40 - 110					12/09/20 18:42	12/18/20 20:16	1

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Plutonium-238	0.00380	U	0.00761	0.00762	0.100	0.00443	pCi/g	12/15/20 12:44	12/22/20 11:15	1
Plutonium-239/240	-0.00571	U	0.00660	0.00661	0.100	0.00767	pCi/g	12/15/20 12:44	12/22/20 11:15	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Pu-242 (T)	91.3		30 - 110					12/15/20 12:44	12/22/20 11:15	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Uranium-234	0.281		0.0497	0.0550	0.250	0.0136	pCi/g	12/15/20 13:10	12/22/20 11:09	1
Uranium-235/236	0.0316		0.0175	0.0177	0.100	0.00565	pCi/g	12/15/20 13:10	12/22/20 11:09	1
Uranium-238	0.314		0.0495	0.0560	0.250	0.00453	pCi/g	12/15/20 13:10	12/22/20 11:09	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	85.9		30 - 110					12/15/20 13:10	12/22/20 11:09	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.296		0.187	0.189		0.0732	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Actinium-227	0.129	U	0.301	0.301		0.322	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Bismuth-212	0.0154	U	0.688	0.688		0.565	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Bismuth-214	0.108	U	0.106	0.106		0.172	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Cesium-137	-0.00376	U	0.0578	0.0578	0.0700	0.0472	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Lead-210	-0.714	U	1.34	1.34		1.14	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Lead-212	0.308		0.0801	0.0863		0.0349	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Lead-214	0.0338	U	0.122	0.122		0.0821	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Potassium-40	7.48		1.36	1.56		0.206	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Protactinium-231	0.000	U	0.941	0.941		1.91	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Protactinium-234	0.0270	U	0.0518	0.0519		0.203	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Radium-226	0.108	U	0.106	0.106	0.200	0.172	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Radium-228	0.296		0.187	0.189		0.0732	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Thallium-208	0.120		0.0848	0.0857		0.0369	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Thorium 228	0.308		0.0801	0.0863		0.0349	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Thorium-232	0.296		0.187	0.189		0.0732	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Thorium-234	0.522		0.557	0.561		0.343	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Uranium-235	0.270		0.151	0.154		0.224	pCi/g	12/04/20 10:34	12/25/20 11:55	1

Eurofins TestAmerica, St. Louis

Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-011

Lab Sample ID: 160-40591-11

Date Collected: 11/23/20 15:17

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	(2σ+/-)						
Uranium-238	0.522		0.557	0.561		0.343	pCi/g	12/04/20 10:34	12/25/20 11:55	1

Client Sample ID: HPPG-317364365-SU28C-012

Lab Sample ID: 160-40591-12

Date Collected: 11/23/20 15:18

Matrix: Solid

Date Received: 11/27/20 09:12

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	(2σ+/-)						
Plutonium-239/240	-0.0115	U	0.0143	0.0144	0.100	0.0141	pCi/g	12/15/20 12:44	12/22/20 11:15	1
<i>Tracer</i>	%Yield	Qualifier	<i>Limits</i>					<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
Pu-242 (T)	87.0		30 - 110					12/15/20 12:44	12/22/20 11:15	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	(2σ+/-)						
Uranium-235/236	0.0214		0.0143	0.0144	0.100	0.00553	pCi/g	12/15/20 13:10	12/22/20 11:09	1
<i>Tracer</i>	%Yield	Qualifier	<i>Limits</i>					<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
Uranium-232	92.8		30 - 110					12/15/20 13:10	12/22/20 11:09	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	(2σ+/-)						
Actinium 228	0.0701	U	0.159	0.159		0.137	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Actinium-227	0.0805	U	0.435	0.435		0.295	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Bismuth-212	0.304	U	0.592	0.593		0.457	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Bismuth-214	0.241		0.0841	0.0877		0.0447	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Cesium-137	0.0282	U	0.0551	0.0552	0.0700	0.0429	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Lead-210	0.779		1.07	1.08		0.714	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Lead-212	0.220		0.0690	0.0746		0.0397	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Lead-214	0.440		0.0933	0.104		0.0484	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Potassium-40	6.03		1.05	1.22		0.268	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Protactinium-231	-0.720	U	2.58	2.58		2.11	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Protactinium-234	0.0231	U	0.0303	0.0304		0.160	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Radium-226	0.241		0.0841	0.0877	0.200	0.0447	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Radium-228	0.0701	U	0.159	0.159		0.137	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Thallium-208	0.0588		0.0375	0.0380		0.0198	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Thorium 228	0.220		0.0690	0.0746		0.0397	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Thorium-232	0.0701	U	0.159	0.159		0.137	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Thorium-234	0.755		0.472	0.479		0.274	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Uranium-235	-0.0323	U	0.0606	0.0607		0.243	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Uranium-238	0.755		0.472	0.479		0.274	pCi/g	12/04/20 10:34	12/25/20 12:01	1

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Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-013

Lab Sample ID: 160-40591-13

Date Collected: 11/23/20 15:21

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.335		0.267	0.270		0.121	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Actinium-227	0.122	U	0.274	0.274		0.328	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Bismuth-212	0.103	U	0.894	0.894		0.725	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Bismuth-214	0.179		0.128	0.129		0.0769	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Cesium-137	-0.0207	U	0.0340	0.0341	0.0700	0.0784	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Lead-210	0.432	U		1.31		0.906	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Lead-212	0.351		0.0885	0.0995		0.0324	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Lead-214	0.0970		0.123	0.123		0.0927	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Potassium-40	7.24		1.45	1.63		0.270	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Protactinium-231	0.000	U	0.193	0.193		1.91	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Protactinium-234	0.107	U	0.125	0.126		0.176	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Radium-226	0.179		0.128	0.129	0.200	0.0769	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Radium-228	0.335		0.267	0.270		0.121	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Thallium-208	0.102		0.0448	0.0461		0.0150	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Thorium 228	0.351		0.0885	0.0995		0.0324	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Thorium-232	0.335		0.267	0.270		0.121	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Thorium-234	-0.139	U	0.790	0.790		0.655	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Uranium-235	0.0406	U	0.174	0.174		0.251	pCi/g	12/04/20 10:34	12/25/20 11:55	1
Uranium-238	-0.139	U	0.790	0.790		0.655	pCi/g	12/04/20 10:34	12/25/20 11:55	1

Client Sample ID: HPPG-317364365-SU28C-014

Lab Sample ID: 160-40591-14

Date Collected: 11/23/20 15:20

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.291		0.0989	0.103		0.0211	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Actinium-227	0.143	U	0.285	0.285		0.242	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Bismuth-212	-0.227	U	0.562	0.562		0.505	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Bismuth-214	0.251		0.0999	0.103		0.0483	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Cesium-137	0.0184	U	0.0328	0.0328	0.0700	0.0247	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Lead-210	-0.625	U	1.38	1.38		1.11	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Lead-212	0.309		0.0623	0.0740		0.0264	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Lead-214	0.292		0.0761	0.0819		0.0399	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Potassium-40	7.88		1.10	1.37		0.237	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Protactinium-231	0.000	U	0.528	0.528		1.56	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Protactinium-234	0.0135	U	0.0336	0.0336		0.170	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Radium-226	0.251		0.0999	0.103	0.200	0.0483	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Radium-228	0.291		0.0989	0.103		0.0211	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Thallium-208	0.0981		0.0427	0.0439		0.0177	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Thorium 228	0.309		0.0623	0.0740		0.0264	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Thorium-232	0.291		0.0989	0.103		0.0211	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Thorium-234	-0.0913	U	0.282	0.283		0.802	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Uranium-235	0.000	U	0.0915	0.0915		0.286	pCi/g	12/04/20 10:34	12/25/20 11:57	1
Uranium-238	-0.0913	U	0.282	0.283		0.802	pCi/g	12/04/20 10:34	12/25/20 11:57	1

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Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-015

Lab Sample ID: 160-40591-15

Date Collected: 11/23/20 15:23

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.357		0.154	0.158		0.0688	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Actinium-227	0.121	U	0.516	0.516		0.315	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Bismuth-212	-0.0144	U	0.737	0.737		0.605	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Bismuth-214	0.276		0.128	0.131		0.0638	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Cesium-137	-0.0487	U	0.0865	0.0866	0.0700	0.0679	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Lead-210	-0.679	U		1.70		1.43	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Lead-212	0.272		0.0805	0.0853		0.0437	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Lead-214	0.417		0.102	0.110		0.0577	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Potassium-40	8.81		1.34	1.61		0.119	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Protactinium-231	-0.918	U	2.98	2.98		2.42	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Protactinium-234	0.00637	U	0.0118	0.0118		0.275	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Radium-226	0.276		0.128	0.131	0.200	0.0638	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Radium-228	0.357		0.154	0.158		0.0688	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Thallium-208	0.127		0.0690	0.0702		0.0318	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Thorium 228	0.272		0.0805	0.0853		0.0437	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Thorium-232	0.357		0.154	0.158		0.0688	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Thorium-234	-0.945	U	0.764	0.772		0.904	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Uranium-235	0.185		0.278	0.279		0.171	pCi/g	12/04/20 10:34	12/25/20 11:58	1
Uranium-238	-0.945	U	0.764	0.772		0.904	pCi/g	12/04/20 10:34	12/25/20 11:58	1

Client Sample ID: HPPG-317364365-SU28C-016

Lab Sample ID: 160-40591-16

Date Collected: 11/23/20 15:24

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.254		0.136	0.138		0.0614	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Actinium-227	0.314		0.347	0.349		0.191	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Bismuth-212	0.0763	U	0.573	0.573		0.466	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Bismuth-214	0.242		0.0721	0.0763		0.0302	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Cesium-137	0.000152	U	0.0514	0.0514	0.0700	0.0423	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Lead-210	1.28		0.884	0.897		0.650	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Lead-212	0.246		0.0550	0.0636		0.0251	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Lead-214	0.308		0.0770	0.0834		0.0388	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Potassium-40	6.88		0.951	1.18		0.0767	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Protactinium-231	-0.651	U	1.99	1.99		1.62	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Protactinium-234	0.0505	U	0.105	0.105		0.158	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Radium-226	0.242		0.0721	0.0763	0.200	0.0302	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Radium-228	0.254		0.136	0.138		0.0614	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Thallium-208	0.124		0.0318	0.0344		0.00475	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Thorium 228	0.246		0.0550	0.0636		0.0251	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Thorium-232	0.254		0.136	0.138		0.0614	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Thorium-234	0.439		0.252	0.257		0.170	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Uranium-235	0.000	U	0.117	0.117		0.261	pCi/g	12/04/20 10:34	12/25/20 12:00	1
Uranium-238	0.439		0.252	0.257		0.170	pCi/g	12/04/20 10:34	12/25/20 12:00	1

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Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-017

Lab Sample ID: 160-40591-17

Date Collected: 11/23/20 15:27

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.222		0.102	0.105		0.155	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Actinium-227	0.129 U		0.357	0.357		0.303	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Bismuth-212	0.000 U		0.517	0.517		0.617	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Bismuth-214	0.367		0.151	0.155		0.0589	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Cesium-137	0.00133 U		0.0503	0.0503	0.0700	0.0413	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Lead-210	0.560 U		1.49	1.50		0.959	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Lead-212	0.306		0.0723	0.0790		0.0305	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Lead-214	0.310		0.0941	0.0992		0.0346	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Potassium-40	9.01		1.54	1.79		0.218	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Protactinium-231	0.197 U		1.30	1.30		2.01	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Protactinium-234	0.0130 U		0.0274	0.0274		0.221	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Radium-226	0.367		0.151	0.155	0.200	0.0589	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Radium-228	0.222		0.102	0.105		0.155	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Thallium-208	0.0999		0.0969	0.0974		0.0463	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Thorium 228	0.306		0.0723	0.0790		0.0305	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Thorium-232	0.222		0.102	0.105		0.155	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Thorium-234	-0.588 U		0.796	0.799		0.674	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Uranium-235	0.145 U		0.257	0.257		0.389	pCi/g	12/04/20 10:34	12/25/20 12:35	1
Uranium-238	-0.588 U		0.796	0.799		0.674	pCi/g	12/04/20 10:34	12/25/20 12:35	1

Client Sample ID: HPPG-317364365-SU28C-018

Lab Sample ID: 160-40591-18

Date Collected: 11/23/20 15:29

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.186		0.162	0.163		0.0822	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Actinium-227	0.110 U		0.269	0.269		0.307	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Bismuth-212	0.175 U		0.598	0.599		0.475	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Bismuth-214	0.291		0.0751	0.0810		0.0116	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Cesium-137	0.0167 U		0.0371	0.0371	0.0700	0.0284	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Lead-210	-0.992 U		1.56	1.56		1.32	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Lead-212	0.238		0.0662	0.0731		0.0343	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Lead-214	0.342		0.0953	0.102		0.0402	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Potassium-40	6.15		1.18	1.33		0.360	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Protactinium-231	0.584 U		1.58	1.59		1.74	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Protactinium-234	0.0110 U		0.189	0.189		0.133	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Radium-226	0.291		0.0751	0.0810	0.200	0.0116	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Radium-228	0.186		0.162	0.163		0.0822	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Thallium-208	0.101		0.0532	0.0542		0.0257	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Thorium 228	0.238		0.0662	0.0731		0.0343	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Thorium-232	0.186		0.162	0.163		0.0822	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Thorium-234	-0.0894 U		0.697	0.697		0.576	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Uranium-235	-0.0463 U		0.121	0.121		0.223	pCi/g	12/04/20 10:34	12/25/20 12:45	1
Uranium-238	-0.0894 U		0.697	0.697		0.576	pCi/g	12/04/20 10:34	12/25/20 12:45	1

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Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-019

Lab Sample ID: 160-40591-19

Date Collected: 11/23/20 15:31

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.433		0.170	0.175		0.0402	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Actinium-227	0.0233	U	0.121	0.121		0.313	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Bismuth-212	-0.0683	U	0.944	0.944		0.825	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Bismuth-214	0.269		0.148	0.150		0.0833	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Cesium-137	0.0133	U	0.0770	0.0770	0.0700	0.0620	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Lead-210	0.788		0.997	1.00		0.682	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Lead-212	0.0202	U	0.112	0.112		0.0913	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Lead-214	0.155		0.0885	0.0899		0.0676	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Potassium-40	7.15		1.79	1.93		0.598	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Protactinium-231	0.000	U	0.831	0.831		1.92	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Protactinium-234	0.0400	U	0.0637	0.0638		0.186	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Radium-226	0.269		0.148	0.150	0.200	0.0833	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Radium-228	0.433		0.170	0.175		0.0402	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Thallium-208	0.0833		0.0417	0.0425		0.0152	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Thorium 228	0.0202	U	0.112	0.112		0.0913	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Thorium-232	0.433		0.170	0.175		0.0402	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Thorium-234	0.474		0.470	0.473		0.338	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Uranium-235	0.120	U	0.254	0.254		0.217	pCi/g	12/04/20 10:34	12/25/20 12:44	1
Uranium-238	0.474		0.470	0.473		0.338	pCi/g	12/04/20 10:34	12/25/20 12:44	1

Client Sample ID: HPPG-317364365-SU28C-020

Lab Sample ID: 160-40591-20

Date Collected: 11/23/20 15:33

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.133		0.226	0.226		0.114	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Actinium-227	0.0860	U	0.182	0.183		0.276	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Bismuth-212	-0.114	U	0.439	0.439		0.480	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Bismuth-214	0.261		0.0873	0.0914		0.0398	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Cesium-137	0.0222	U	0.0364	0.0365	0.0700	0.0275	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Lead-210	0.201	U	1.08	1.08		0.878	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Lead-212	0.258		0.0632	0.0715		0.0334	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Lead-214	0.275		0.0712	0.0768		0.0399	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Potassium-40	6.50		1.16	1.34		0.369	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Protactinium-231	0.262	U	1.00	1.00		1.57	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Protactinium-234	0.111	U	0.183	0.184		0.156	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Radium-226	0.261		0.0873	0.0914	0.200	0.0398	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Radium-228	0.133		0.226	0.226		0.114	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Thallium-208	0.113		0.0407	0.0423		0.0148	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Thorium 228	0.258		0.0632	0.0715		0.0334	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Thorium-232	0.133		0.226	0.226		0.114	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Thorium-234	0.284	U	0.536	0.537		0.492	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Uranium-235	0.0616	U	0.110	0.110		0.288	pCi/g	12/04/20 10:34	12/25/20 12:50	1
Uranium-238	0.284	U	0.536	0.537		0.492	pCi/g	12/04/20 10:34	12/25/20 12:50	1

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Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-021

Lab Sample ID: 160-40591-21

Matrix: Solid

Date Collected: 11/23/20 15:35
Date Received: 11/27/20 09:12

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Strontium-90	0.194		0.166	0.167	0.331	0.121	pCi/g	12/09/20 18:42	12/18/20 20:16	1
<i>Carrier</i>	%Yield	Qualifier	<i>Limits</i>					<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
Sr Carrier	92.9		40 - 110					12/09/20 18:42	12/18/20 20:16	1
Y Carrier	95.0		40 - 110					12/09/20 18:42	12/18/20 20:16	1

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Plutonium-238	-0.00412	U	0.0130	0.0130	0.100	0.0117	pCi/g	12/15/20 12:44	12/22/20 11:15	1
Plutonium-239/240	-0.00206	U	0.00921	0.00921	0.100	0.00830	pCi/g	12/15/20 12:44	12/22/20 11:15	1
<i>Tracer</i>	%Yield	Qualifier	<i>Limits</i>					<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
Pu-242 (T)	83.9		30 - 110					12/15/20 12:44	12/22/20 11:15	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Uranium-234	0.224		0.0432	0.0471	0.250	0.00798	pCi/g	12/15/20 13:10	12/22/20 11:09	1
Uranium-235/236	0.0123		0.0110	0.0111	0.100	0.00574	pCi/g	12/15/20 13:10	12/22/20 11:09	1
Uranium-238	0.299		0.0489	0.0550	0.250	0.00460	pCi/g	12/15/20 13:10	12/22/20 11:09	1
<i>Tracer</i>	%Yield	Qualifier	<i>Limits</i>					<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
Uranium-232	89.9		30 - 110					12/15/20 13:10	12/22/20 11:09	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.331		0.127	0.132		0.0285	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Actinium-227	0.0395	U	0.493	0.493		0.305	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Bismuth-212	0.0133	U	0.596	0.596		0.490	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Bismuth-214	0.158	U	0.0845	0.0860		0.190	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Cesium-137	0.0242	U	0.0461	0.0462	0.0700	0.0350	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Lead-210	1.02		1.12	1.13		0.768	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Lead-212	0.201		0.0687	0.0718		0.0386	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Lead-214	0.321		0.0905	0.0962		0.0412	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Potassium-40	8.78		1.29	1.57		0.111	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Protactinium-231	-0.503	U	2.39	2.39		1.95	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Protactinium-234	0.0731	U	0.222	0.222		0.180	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Radium-226	0.158	U	0.0845	0.0860	0.200	0.190	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Radium-228	0.331		0.127	0.132		0.0285	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Thallium-208	0.101		0.0668	0.0676		0.0295	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Thorium 228	0.201		0.0687	0.0718		0.0386	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Thorium-232	0.331		0.127	0.132		0.0285	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Thorium-234	0.581		0.499	0.503		0.348	pCi/g	12/04/20 10:34	12/25/20 12:51	1
Uranium-235	0.0347	U	0.202	0.202		0.346	pCi/g	12/04/20 10:34	12/25/20 12:51	1

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Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-021

Lab Sample ID: 160-40591-21

Date Collected: 11/23/20 15:35

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Uranium-238	0.581		0.499	0.503		0.348	pCi/g	12/04/20 10:34	12/25/20 12:51	1

Client Sample ID: HPPG-317364365-SU28C-022

Lab Sample ID: 160-40591-22

Date Collected: 11/23/20 15:38

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.373		0.146	0.152		0.0334	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Actinium-227	0.116	U	0.544	0.544		0.333	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Bismuth-212	0.185	U	0.977	0.977		0.790	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Bismuth-214	0.330		0.123	0.128		0.0509	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Cesium-137	0.00385	U	0.0774	0.0774	0.0700	0.0634	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Lead-210	1.41		1.42	1.43		0.901	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Lead-212	0.252		0.0862	0.0912		0.0516	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Lead-214	0.252		0.118	0.121		0.0722	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Potassium-40	8.50		1.43	1.73		0.295	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Protactinium-231	0.377	U	1.37	1.37		2.17	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Protactinium-234	0.133	U	0.245	0.246		0.217	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Radium-226	0.330		0.123	0.128	0.200	0.0509	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Radium-228	0.373		0.146	0.152		0.0334	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Thallium-208	0.0674		0.0712	0.0716		0.0339	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Thorium 228	0.252		0.0862	0.0912		0.0516	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Thorium-232	0.373		0.146	0.152		0.0334	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Thorium-234	0.836		0.636	0.644		0.380	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Uranium-235	-0.0224	U	0.340	0.340		0.405	pCi/g	12/04/20 10:34	12/25/20 12:52	1
Uranium-238	0.836		0.636	0.644		0.380	pCi/g	12/04/20 10:34	12/25/20 12:52	1

Client Sample ID: HPPG-317364365-SU28C-023

Lab Sample ID: 160-40591-23

Date Collected: 11/23/20 15:41

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.436		0.157	0.164		0.0328	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Actinium-227	0.117	U	0.355	0.356		0.355	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Bismuth-212	0.338	U	0.647	0.648		0.492	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Bismuth-214	0.279		0.126	0.130		0.0599	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Cesium-137	0.0270	U	0.0507	0.0508	0.0700	0.0384	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Lead-210	-2.18	U	0.993	1.04		1.48	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Lead-212	0.259		0.0808	0.0864		0.0451	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Lead-214	0.271		0.107	0.112		0.0534	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Potassium-40	7.35		1.32	1.57		0.289	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Protactinium-231	0.000	U	0.298	0.298		2.19	pCi/g	12/04/20 10:34	12/25/20 12:01	1

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Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-023

Lab Sample ID: 160-40591-23

Date Collected: 11/23/20 15:41

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Protactinium-234	0.0790	U	0.240	0.240		0.195	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Radium-226	0.279		0.126	0.130	0.200	0.0599	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Radium-228	0.436		0.157	0.164		0.0328	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Thallium-208	0.0626		0.0692	0.0695		0.0409	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Thorium 228	0.259		0.0808	0.0864		0.0451	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Thorium-232	0.436		0.157	0.164		0.0328	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Thorium-234	-0.855	U	0.823	0.829		0.583	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Uranium-235	-0.189	U	0.604	0.604		0.441	pCi/g	12/04/20 10:34	12/25/20 12:01	1
Uranium-238	-0.855	U	0.823	0.829		0.583	pCi/g	12/04/20 10:34	12/25/20 12:01	1

Client Sample ID: HPPG-317364365-SU28C-024

Lab Sample ID: 160-40591-24

Date Collected: 11/23/20 15:43

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.243		0.192	0.193		0.0876	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Actinium-227	-0.276	U	0.835	0.835		0.343	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Bismuth-212	-0.419	U	0.536	0.537		0.549	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Bismuth-214	0.342		0.108	0.113		0.0480	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Cesium-137	0.0181	U	0.0391	0.0391	0.0700	0.0301	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Lead-210	0.510	U	1.22	1.22		0.975	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Lead-212	0.368		0.0728	0.0870		0.0335	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Lead-214	0.294		0.0885	0.0936		0.0433	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Potassium-40	7.40		1.11	1.34		0.253	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Protactinium-231	0.446	U	1.62	1.62		1.74	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Protactinium-234	0.201		0.151	0.153		0.178	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Radium-226	0.342		0.108	0.113	0.200	0.0480	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Radium-228	0.243		0.192	0.193		0.0876	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Thallium-208	0.136		0.0419	0.0442		0.0144	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Thorium 228	0.368		0.0728	0.0870		0.0335	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Thorium-232	0.243		0.192	0.193		0.0876	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Thorium-234	0.567	U	0.478	0.483		0.693	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Uranium-235	-0.0736	U	0.389	0.390		0.319	pCi/g	12/04/20 14:01	12/25/20 08:15	1
Uranium-238	0.567	U	0.478	0.483		0.693	pCi/g	12/04/20 14:01	12/25/20 08:15	1

Client Sample ID: HPPG-317364365-SU28C-025

Lab Sample ID: 160-40591-25

Date Collected: 11/23/20 15:47

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.122	U	0.234	0.235		0.150	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Actinium-227	0.0181	U	0.0276	0.0276		0.306	pCi/g	12/04/20 14:01	12/25/20 08:17	1

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Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-317364365-SU28C-025

Lab Sample ID: 160-40591-25

Date Collected: 11/23/20 15:47

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Bismuth-212	0.504	U	0.963	0.964		0.756	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Bismuth-214	0.289		0.103	0.108		0.0444	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Cesium-137	0.00116	U	0.0634	0.0634	0.0700	0.0521	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Lead-210	-1.02	U	1.84	1.84		1.55	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Lead-212	0.296		0.0780	0.0839		0.0388	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Lead-214	0.312		0.106	0.111		0.0617	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Potassium-40	9.36		1.36	1.66		0.116	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Protactinium-231	0.348	U	1.33	1.33		2.09	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Protactinium-234	-0.0949	U	0.288	0.288		0.234	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Radium-226	0.289		0.103	0.108	0.200	0.0444	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Radium-228	0.122	U	0.234	0.235		0.150	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Thallium-208	0.109		0.0535	0.0546		0.0218	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Thorium 228	0.296		0.0780	0.0839		0.0388	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Thorium-232	0.122	U	0.234	0.235		0.150	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Thorium-234	0.606		0.605	0.609		0.388	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Uranium-235	0.129	U	0.461	0.461		0.375	pCi/g	12/04/20 14:01	12/25/20 08:17	1
Uranium-238	0.606		0.605	0.609		0.388	pCi/g	12/04/20 14:01	12/25/20 08:17	1

Client Sample ID: HPPG-F-045

Lab Sample ID: 160-40591-26

Date Collected: 11/23/20 15:18

Matrix: Solid

Date Received: 11/27/20 09:12

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Plutonium-239/240	0.00202	U	0.0107	0.0107	0.100	0.00815	pCi/g	12/15/20 12:44	12/22/20 11:15	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Pu-242 (T)	97.4		30 - 110					12/15/20 12:44	12/22/20 11:15	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Uranium-235/236	0.0173		0.0131	0.0131	0.100	0.00574	pCi/g	12/15/20 13:10	12/22/20 11:09	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	89.4		30 - 110					12/15/20 13:10	12/22/20 11:09	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.356		0.0957	0.102		0.0618	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Actinium-227	0.316		0.332	0.334		0.181	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Bismuth-212	-0.343	U	0.625	0.626		0.490	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Bismuth-214	0.0499	U	0.105	0.105		0.0992	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Cesium-137	-0.00224	U	0.0403	0.0403	0.0700	0.0330	pCi/g	12/04/20 14:01	12/25/20 08:18	1

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Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Client Sample ID: HPPG-F-045

Date Collected: 11/23/20 15:18
Date Received: 11/27/20 09:12

Lab Sample ID: 160-40591-26

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Lead-210	-0.577	U	1.25	1.25		1.01	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Lead-212	0.265		0.0573	0.0667		0.0261	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Lead-214	0.224		0.0698	0.0735		0.0351	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Potassium-40	6.26		0.911	1.11		0.0772	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Protactinium-231	0.000	U	0.552	0.552		1.42	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Protactinium-234	-0.0830	U	0.236	0.236		0.192	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Radium-226	0.0499	U	0.105	0.105	0.200	0.0992	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Radium-228	0.356		0.0957	0.102		0.0618	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Thallium-208	0.103		0.0389	0.0404		0.0135	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Thorium 228	0.265		0.0573	0.0667		0.0261	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Thorium-232	0.356		0.0957	0.102		0.0618	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Thorium-234	0.365		0.260	0.264		0.213	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Uranium-235	0.0262	U	0.0382	0.0383		0.349	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Uranium-238	0.365		0.260	0.264		0.213	pCi/g	12/04/20 14:01	12/25/20 08:18	1

Client Sample ID: HPPG-F-046

Date Collected: 11/23/20 15:27
Date Received: 11/27/20 09:12

Lab Sample ID: 160-40591-27

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.552		0.187	0.195		0.0353	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Actinium-227	0.151	U	0.369	0.370		0.343	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Bismuth-212	0.0473	U	0.571	0.571		0.464	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Bismuth-214	0.114	U	0.124	0.124		0.124	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Cesium-137	-0.0521	U	0.0822	0.0824	0.0700	0.0635	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Lead-210	-0.477	U	1.39	1.39		1.16	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Lead-212	0.195		0.106	0.109		0.0540	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Lead-214	0.166		0.133	0.135		0.0979	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Potassium-40	7.52		1.40	1.59		0.263	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Protactinium-231	0.000	U	0.424	0.424		2.85	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Protactinium-234	0.0883	U	0.191	0.191		0.221	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Radium-226	0.114	U	0.124	0.124	0.200	0.124	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Radium-228	0.552		0.187	0.195		0.0353	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Thallium-208	0.0412		0.0757	0.0758		0.0390	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Thorium 228	0.195		0.106	0.109		0.0540	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Thorium-232	0.552		0.187	0.195		0.0353	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Thorium-234	-0.864	U	0.769	0.775		1.09	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Uranium-235	-0.00797	U	0.408	0.408		0.381	pCi/g	12/04/20 14:01	12/25/20 08:18	1
Uranium-238	-0.864	U	0.769	0.775		1.09	pCi/g	12/04/20 14:01	12/25/20 08:18	1

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QC Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Method: 905 - Strontium-90 (GFPC)

Lab Sample ID: MB 160-490804/22-A

Matrix: Solid

Analysis Batch: 491746

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 490804

Analyte	Result	MB MB		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
		MB	MB								
Strontium-90	0.1449			0.155	0.156	0.331	0.117	pCi/g	12/03/20 11:35	12/14/20 17:12	1
Carrier											
<i>Sr Carrier</i> 102											
<i>Y Carrier</i> 92.7											

Lab Sample ID: LCS 160-490804/1-A

Matrix: Solid

Analysis Batch: 491659

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 490804

Analyte	Result	Spike MB MB		LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
		Added	MB								
Strontium-90	7.76			5.722	J	0.669	0.331	0.147	pCi/g	74	75 - 125
Carrier											
<i>Sr Carrier</i> 80.9											
<i>Y Carrier</i> 93.8											

Lab Sample ID: MB 160-491323/23-A

Matrix: Solid

Analysis Batch: 492430

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 491323

Analyte	Result	MB MB		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
		MB	MB								
Strontium-90	0.07392	U		0.140	0.140	0.331	0.108	pCi/g	12/09/20 18:42	12/18/20 20:20	1
Carrier											
<i>Sr Carrier</i> 100											
<i>Y Carrier</i> 92.7											

Lab Sample ID: LCS 160-491323/1-A

Matrix: Solid

Analysis Batch: 492430

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 491323

Analyte	Result	Spike MB MB		LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
		Added	MB								
Strontium-90	7.76			5.897	J	0.638	0.331	0.109	pCi/g	76	75 - 125
Carrier											
<i>Sr Carrier</i> 100											
<i>Y Carrier</i> 99.8											

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QC Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Lab Sample ID: MB 160-491935/1-A

Matrix: Solid

Analysis Batch: 492942

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 491935

Analyte	Result	MB	MB	Count	Total	DLC	Unit	Prepared	Analyzed	Dil Fac
				Uncert. (2σ+/-)	Uncert. (2σ+/-)					
Uranium-234	0.02388			0.0168	0.0170	0.250	0.00855 pCi/g	12/15/20 13:10	12/22/20 16:24	1
Uranium-235/236	0.0000	U		0.00914	0.00914	0.100	0.00752 pCi/g	12/15/20 13:10	12/22/20 16:24	1
Uranium-238	0.003666	U		0.00733	0.00734	0.250	0.00426 pCi/g	12/15/20 13:10	12/22/20 16:24	1
Tracer	%Yield	MB	MB	Spike Added	Total Uncert. (2σ+/-)	DLC	Unit	Prepared	Analyzed	Dil Fac
				Qualifier	Limits					
Uranium-232	94.3				30 - 110			12/15/20 13:10	12/22/20 16:24	1

Lab Sample ID: LCS 160-491935/2-A

Matrix: Solid

Analysis Batch: 492945

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 491935

Analyte	Result	MB	MB	Spike	LCS	LCS	Total	DLC	Unit	%Rec	Limits
				Added	Result	Qual	Uncert. (2σ+/-)				
Uranium-234				3.18	2.903		0.286	0.250	0.0116 pCi/g	91	84 - 120
Uranium-238				3.26	2.976		0.291	0.250	0.00437 pCi/g	91	82 - 122
Tracer	%Yield	MB	MB	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	DLC	Unit	%Rec	Limits
					Limits						
Uranium-232	89.3				30 - 110						

Lab Sample ID: 160-40591-1 DU

Matrix: Solid

Analysis Batch: 492921

Client Sample ID: HPPG-317364365-SU28C-001

Prep Type: Total/NA

Prep Batch: 491935

Analyte	Result	Sample	Sample	DU	DU	Total	DLC	Unit	RER	Limit	
				Result	Qual	Uncert. (2σ+/-)					
Uranium-234	0.361			0.3280		0.0581	0.250	0.00887 pCi/g	0.27	1	
Uranium-235/23	0.0172			0.01661		0.0143	0.100	0.00552 pCi/g	0.02	1	
Uranium-238	0.324			0.3045		0.0548	0.250	0.00443 pCi/g	0.18	1	
Tracer	%Yield	DU	DU	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	DLC	Unit	RER	Limit
					Limits						
Uranium-232	95.6				30 - 110						

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Lab Sample ID: MB 160-491931/1-A

Matrix: Solid

Analysis Batch: 492849

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 491931

Analyte	Result	Sample	Sample	Count	Total	DLC	Unit	Prepared	Analyzed	Dil Fac	
				Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Plutonium-238	-0.005773	U		0.00861	0.00862	0.100	0.00895 pCi/g	12/15/20 12:44	12/22/20 11:15	1	
Plutonium-239/240	-0.001926	U		0.00861	0.00862	0.100	0.00776 pCi/g	12/15/20 12:44	12/22/20 11:15	1	
Tracer	%Yield	MB	MB	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	DLC	Unit	RER	Limit
					Limits						
Pu-242 (T)	103				30 - 110						

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QC Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCS 160-491931/2-A
Matrix: Solid
Analysis Batch: 492847

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 491931

Analyte	Spike Added	LCS		Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
		Result	Qual						
Plutonium-238	2.61	2.812		0.279	0.100	0.0120	pCi/g	108	80 - 125
Plutonium-239/2	2.64	2.642		0.265	0.100	0.00909	pCi/g	100	81 - 125
40									
Tracer	LCS	LCS							
Pu-242 (T)	%Yield	Qualifier	Limits						
	90.1		30 - 110						

Lab Sample ID: 160-40591-1 DU
Matrix: Solid
Analysis Batch: 492845

Client Sample ID: HPPG-317364365-SU28C-001
Prep Type: Total/NA
Prep Batch: 491931

Analyte	Sample		DU		Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
	Result	Qual	Result	Qual						
Plutonium-238	0.00193	U	-0.00805	U	0.0140	0.100	0.0132	pCi/g	0.44	1
40			4							
Plutonium-239/2	-0.00193	U	-0.01411	U	0.0122	0.100	0.0133	pCi/g	0.59	1
40										
Tracer	DU	DU								
Pu-242 (T)	%Yield	Qualifier	Limits							
	86.6		30 - 110							

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-490802/1-A
Matrix: Solid
Analysis Batch: 492976

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490802

Analyte	MB		Count (2σ+/-)	Total (2σ+/-)		LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	MB Qualifier		Result	Qual						
Actinium 228	-0.03762	U	0.218	0.218		0.113	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Actinium-227	-0.3031	U	0.525	0.526		0.335	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Bismuth-212	-0.3011	U	0.398	0.399		0.562	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Bismuth-214	-0.06394	U	0.114	0.114		0.134	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Cesium-137	0.0000	U	0.00946	0.00946	0.0700	0.0181	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Lead-210	0.2354	U	0.771	0.771		0.611	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Lead-212	-0.004504	U	0.0798	0.0798		0.0671	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Lead-214	-0.04921	U	0.0735	0.0737		0.0644	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Potassium-40	0.09750	U	0.430	0.430		0.327	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Protactinium-231	0.2248	U	0.795	0.795		1.45	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Protactinium-234	0.01682	U	0.0825	0.0825		0.0661	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Radium-226	-0.06394	U	0.114	0.114	0.200	0.134	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Radium-228	-0.03762	U	0.218	0.218		0.113	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Thallium-208	0.007245	U	0.0113	0.0113		0.0301	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Thorium 228	-0.004504	U	0.0798	0.0798		0.0671	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Thorium-232	-0.03762	U	0.218	0.218		0.113	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Thorium-234	0.0000	U	0.143	0.143		0.539	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Uranium-235	0.05006	U	0.229	0.229		0.185	pCi/g	12/03/20 11:24	12/24/20 10:35		1
Uranium-238	0.0000	U	0.143	0.143		0.539	pCi/g	12/03/20 11:24	12/24/20 10:35		1

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QC Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: LCS 160-490802/2-A
Matrix: Solid
Analysis Batch: 492974

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490802

Analyte	Spike Added	LCS		Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
		Result	Qual						
Americium-241	96.4	91.19		9.58		0.524	pCi/g	95	87 - 116
Cesium-137	26.7	25.30		2.69	0.0700	0.0802	pCi/g	95	87 - 120
Cobalt-60	9.43	8.864		0.930		0.0237	pCi/g	94	87 - 115

Lab Sample ID: MB 160-490911/1-A
Matrix: Solid
Analysis Batch: 493020

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490911

Analyte	MB Result	MB Qualifier	Count		Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Result	Uncert. (2σ+/-)							
Actinium 228	0.1038		0.0928	0.0934			0.0546	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Actinium-227	0.1282	U	0.241	0.241			0.260	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Bismuth-212	0.3620	U	0.818	0.819			0.615	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Bismuth-214	-0.1607	U	0.181	0.182			0.220	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Cesium-137	-0.02561	U	0.0483	0.0484	0.0700	0.0535	pCi/g	12/04/20 10:34	12/25/20 11:14	1	
Lead-210	-0.4911	U	1.35	1.36			1.02	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Lead-212	0.005307	U	0.0914	0.0914			0.0745	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Lead-214	-0.1410	U	0.127	0.128			0.118	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Potassium-40	-0.2060	U	1.06	1.06			0.631	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Protactinium-231	0.2194	U	1.93	1.93			1.57	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Protactinium-234	0.04565	U	0.0796	0.0797			0.186	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Radium-226	-0.1607	U	0.181	0.182	0.200	0.220	pCi/g	12/04/20 10:34	12/25/20 11:14	1	
Radium-228	0.1038		0.0928	0.0934			0.0546	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Thallium-208	0.004501	U	0.00894	0.00895			0.0492	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Thorium 228	0.005307	U	0.0914	0.0914			0.0745	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Thorium-232	0.1038		0.0928	0.0934			0.0546	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Thorium-234	-0.5387	U	0.573	0.576			0.561	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Uranium-235	0.07193	U	0.247	0.247			0.196	pCi/g	12/04/20 10:34	12/25/20 11:14	1
Uranium-238	-0.5387	U	0.573	0.576			0.561	pCi/g	12/04/20 10:34	12/25/20 11:14	1

Lab Sample ID: LCS 160-490911/2-A
Matrix: Solid
Analysis Batch: 493018

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490911

Analyte	Spike Added	LCS		Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
		Result	Qual						
Americium-241	96.4	93.13		11.0		0.548	pCi/g	97	87 - 116
Cesium-137	26.7	27.79		2.94	0.0700	0.126	pCi/g	104	87 - 120
Cobalt-60	9.43	9.500		1.02		0.0475	pCi/g	101	87 - 115

Lab Sample ID: 160-40591-23 DU
Matrix: Solid
Analysis Batch: 493022

Client Sample ID: HPPG-317364365-SU28C-023
Prep Type: Total/NA
Prep Batch: 490911

Analyte	Sample		DU		Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
	Result	Qual	Result	Qual						
Actinium 228	0.436		0.2508		0.108		0.0738	pCi/g	0.68	1
Actinium-227	0.117	U	-0.2280	U	0.472		0.272	pCi/g	0.42	1

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QC Sample Results

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 Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

 Job ID: 160-40591-1
 SDG: GJ46599745

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-40591-23 DU
Matrix: Solid
Analysis Batch: 493022

Client Sample ID: HPPG-317364365-SU28C-023
Prep Type: Total/NA
Prep Batch: 490911

Analyte	Sample	Sample	DU		DU		Total				RER	Limit
	Result	Qual	Result	Qual	(2σ+/-)	LOQ	DLC	Unit	RER			
Bismuth-212	0.338	U	0.2986	U	0.497		0.381	pCi/g			0.03	1
Bismuth-214	0.279		0.2594		0.0842		0.0352	pCi/g			0.09	1
Cesium-137	0.0270	U	-0.01461	U	0.0355	0.0700	0.0277	pCi/g			0.48	1
Lead-210	-2.18	U	-0.4284	U	1.12		0.905	pCi/g			0.81	1
Lead-212	0.259		0.2334		0.0651		0.0304	pCi/g			0.17	1
Lead-214	0.271		0.1909		0.0720		0.0691	pCi/g			0.44	1
Potassium-40	7.35		6.425		1.12		0.0752	pCi/g			0.34	1
Protactinium-231	0.000	U	0.0000	U	0.207		1.43	pCi/g			0	1
Protactinium-234	0.0790	U	0.02687	U	0.179		0.147	pCi/g			0.12	1
Radium-226	0.279		0.2594		0.0842	0.200	0.0352	pCi/g			0.09	1
Radium-228	0.436		0.2508		0.108		0.0738	pCi/g			0.68	1
Thallium-208	0.0626		0.1254		0.0375		0.00851	pCi/g			0.59	1
Thorium 228	0.259		0.2334		0.0651		0.0304	pCi/g			0.17	1
Thorium-232	0.436		0.2508		0.108		0.0738	pCi/g			0.68	1
Thorium-234	-0.855	U	0.2243	U	0.564		0.456	pCi/g			0.77	1
Uranium-235	-0.189	U	-0.00781	U	0.0135		0.256	pCi/g			0.29	1
			3									
Uranium-238	-0.855	U	0.2243	U	0.564		0.456	pCi/g			0.77	1

Lab Sample ID: MB 160-490932/1-A
Matrix: Solid
Analysis Batch: 493019

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490932

Analyte	MB	MB	Count	Total		LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert.	(2σ+/-)	Uncert.						
Actinium 228	0.1066	U	0.0739	0.0747			0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Actinium-227	0.2114	U	0.369	0.370			0.252	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Bismuth-212	-0.5716	U	0.701	0.704			0.748	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Bismuth-214	0.1200		0.0849	0.0858			0.0937	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Cesium-137	0.01945	U	0.0528	0.0528	0.0700	0.0284	pCi/g	12/04/20 14:01	12/25/20 08:14		1
Lead-210	-1.091	U	1.58	1.59			1.35	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-212	0.05856		0.0656	0.0660			0.0417	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-214	-0.004878	U	0.0790	0.0790			0.0648	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Potassium-40	-0.3926	U	1.05	1.05			0.608	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Protactinium-231	-0.7658	U	2.88	2.88			2.34	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Protactinium-234	0.1086		0.163	0.164			0.0693	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Radium-226	0.1200		0.0849	0.0858	0.200	0.0937	pCi/g	12/04/20 14:01	12/25/20 08:14		1
Radium-228	0.1066	U	0.0739	0.0747			0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thallium-208	0.006909	U	0.0135	0.0135			0.0442	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium 228	0.05856		0.0656	0.0660			0.0417	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium-232	0.1066	U	0.0739	0.0747			0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium-234	-0.7448	U	0.597	0.603			0.681	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Uranium-235	0.07022	U	0.183	0.183			0.144	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Uranium-238	-0.7448	U	0.597	0.603			0.681	pCi/g	12/04/20 14:01	12/25/20 08:14	1

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QC Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-490932/2-A

Client Sample ID: Lab Control Sample

Matrix: Solid

Prep Type: Total/NA

Analysis Batch: 493020

Prep Batch: 490932

Analyte	Spike Added	LCS		Total		DLC	Unit	%Rec	%Rec. Limits
		Result	Qual	Uncert. (2σ+/-)	LOQ				
Americium-241	96.4	96.82		10.2		0.624	pCi/g	100	87 - 116
Cesium-137	26.7	26.82		2.90	0.0700	0.119	pCi/g	100	87 - 120
Cobalt-60	9.43	9.590		1.04		0.0186	pCi/g	102	87 - 115

Eurofins TestAmerica, St. Louis

QC Association Summary

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Rad

Leach Batch: 490573

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40591-1	HPPG-317364365-SU28C-001	Total/NA	Solid	Dry and Grind	
160-40591-2	HPPG-317364365-SU28C-002	Total/NA	Solid	Dry and Grind	
160-40591-3	HPPG-317364365-SU28C-003	Total/NA	Solid	Dry and Grind	
160-40591-4	HPPG-317364365-SU28C-004	Total/NA	Solid	Dry and Grind	
160-40591-5	HPPG-317364365-SU28C-005	Total/NA	Solid	Dry and Grind	
160-40591-1 DU	HPPG-317364365-SU28C-001	Total/NA	Solid	Dry and Grind	

Leach Batch: 490606

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40591-6	HPPG-317364365-SU28C-006	Total/NA	Solid	Dry and Grind	
160-40591-7	HPPG-317364365-SU28C-007	Total/NA	Solid	Dry and Grind	
160-40591-8	HPPG-317364365-SU28C-008	Total/NA	Solid	Dry and Grind	
160-40591-9	HPPG-317364365-SU28C-009	Total/NA	Solid	Dry and Grind	
160-40591-10	HPPG-317364365-SU28C-010	Total/NA	Solid	Dry and Grind	
160-40591-11	HPPG-317364365-SU28C-011	Total/NA	Solid	Dry and Grind	
160-40591-12	HPPG-317364365-SU28C-012	Total/NA	Solid	Dry and Grind	
160-40591-13	HPPG-317364365-SU28C-013	Total/NA	Solid	Dry and Grind	
160-40591-14	HPPG-317364365-SU28C-014	Total/NA	Solid	Dry and Grind	
160-40591-15	HPPG-317364365-SU28C-015	Total/NA	Solid	Dry and Grind	
160-40591-16	HPPG-317364365-SU28C-016	Total/NA	Solid	Dry and Grind	
160-40591-17	HPPG-317364365-SU28C-017	Total/NA	Solid	Dry and Grind	
160-40591-18	HPPG-317364365-SU28C-018	Total/NA	Solid	Dry and Grind	
160-40591-19	HPPG-317364365-SU28C-019	Total/NA	Solid	Dry and Grind	
160-40591-20	HPPG-317364365-SU28C-020	Total/NA	Solid	Dry and Grind	
160-40591-21	HPPG-317364365-SU28C-021	Total/NA	Solid	Dry and Grind	
160-40591-22	HPPG-317364365-SU28C-022	Total/NA	Solid	Dry and Grind	
160-40591-23	HPPG-317364365-SU28C-023	Total/NA	Solid	Dry and Grind	
160-40591-24	HPPG-317364365-SU28C-024	Total/NA	Solid	Dry and Grind	
160-40591-25	HPPG-317364365-SU28C-025	Total/NA	Solid	Dry and Grind	
160-40591-26	HPPG-F-045	Total/NA	Solid	Dry and Grind	
160-40591-27	HPPG-F-046	Total/NA	Solid	Dry and Grind	
160-40591-23 DU	HPPG-317364365-SU28C-023	Total/NA	Solid	Dry and Grind	

Prep Batch: 490802

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40591-1	HPPG-317364365-SU28C-001	Total/NA	Solid	Fill_Geo-21	490573
160-40591-2	HPPG-317364365-SU28C-002	Total/NA	Solid	Fill_Geo-21	490573
160-40591-3	HPPG-317364365-SU28C-003	Total/NA	Solid	Fill_Geo-21	490573
160-40591-4	HPPG-317364365-SU28C-004	Total/NA	Solid	Fill_Geo-21	490573
160-40591-5	HPPG-317364365-SU28C-005	Total/NA	Solid	Fill_Geo-21	490573
MB 160-490802/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490802/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 490804

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40591-1	HPPG-317364365-SU28C-001	Total/NA	Solid	DPS-7	490573
MB 160-490804/22-A	Method Blank	Total/NA	Solid	DPS-7	
LCS 160-490804/1-A	Lab Control Sample	Total/NA	Solid	DPS-7	

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QC Association Summary

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40591-1
SDG: GJ46599745

Rad

Prep Batch: 490911

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40591-6	HPPG-317364365-SU28C-006	Total/NA	Solid	Fill_Geo-21	490606
160-40591-7	HPPG-317364365-SU28C-007	Total/NA	Solid	Fill_Geo-21	490606
160-40591-8	HPPG-317364365-SU28C-008	Total/NA	Solid	Fill_Geo-21	490606
160-40591-9	HPPG-317364365-SU28C-009	Total/NA	Solid	Fill_Geo-21	490606
160-40591-10	HPPG-317364365-SU28C-010	Total/NA	Solid	Fill_Geo-21	490606
160-40591-11	HPPG-317364365-SU28C-011	Total/NA	Solid	Fill_Geo-21	490606
160-40591-12	HPPG-317364365-SU28C-012	Total/NA	Solid	Fill_Geo-21	490606
160-40591-13	HPPG-317364365-SU28C-013	Total/NA	Solid	Fill_Geo-21	490606
160-40591-14	HPPG-317364365-SU28C-014	Total/NA	Solid	Fill_Geo-21	490606
160-40591-15	HPPG-317364365-SU28C-015	Total/NA	Solid	Fill_Geo-21	490606
160-40591-16	HPPG-317364365-SU28C-016	Total/NA	Solid	Fill_Geo-21	490606
160-40591-17	HPPG-317364365-SU28C-017	Total/NA	Solid	Fill_Geo-21	490606
160-40591-18	HPPG-317364365-SU28C-018	Total/NA	Solid	Fill_Geo-21	490606
160-40591-19	HPPG-317364365-SU28C-019	Total/NA	Solid	Fill_Geo-21	490606
160-40591-20	HPPG-317364365-SU28C-020	Total/NA	Solid	Fill_Geo-21	490606
160-40591-21	HPPG-317364365-SU28C-021	Total/NA	Solid	Fill_Geo-21	490606
160-40591-22	HPPG-317364365-SU28C-022	Total/NA	Solid	Fill_Geo-21	490606
160-40591-23	HPPG-317364365-SU28C-023	Total/NA	Solid	Fill_Geo-21	490606
MB 160-490911/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490911/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-40591-23 DU	HPPG-317364365-SU28C-023	Total/NA	Solid	Fill_Geo-21	490606

Prep Batch: 490932

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40591-24	HPPG-317364365-SU28C-024	Total/NA	Solid	Fill_Geo-21	490606
160-40591-25	HPPG-317364365-SU28C-025	Total/NA	Solid	Fill_Geo-21	490606
160-40591-26	HPPG-F-045	Total/NA	Solid	Fill_Geo-21	490606
160-40591-27	HPPG-F-046	Total/NA	Solid	Fill_Geo-21	490606
MB 160-490932/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490932/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Leach Batch: 491310

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40591-26	HPPG-F-045	Total/NA	Solid	Dry and Grind	

Prep Batch: 491323

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40591-11	HPPG-317364365-SU28C-011	Total/NA	Solid	DPS-7	490606
160-40591-21	HPPG-317364365-SU28C-021	Total/NA	Solid	DPS-7	490606
MB 160-491323/23-A	Method Blank	Total/NA	Solid	DPS-7	
LCS 160-491323/1-A	Lab Control Sample	Total/NA	Solid	DPS-7	

Prep Batch: 491931

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40591-1	HPPG-317364365-SU28C-001	Total/NA	Solid	ExtChrom	490573
160-40591-11	HPPG-317364365-SU28C-011	Total/NA	Solid	ExtChrom	490606
160-40591-12	HPPG-317364365-SU28C-012	Total/NA	Solid	ExtChrom	491932
160-40591-21	HPPG-317364365-SU28C-021	Total/NA	Solid	ExtChrom	490606
160-40591-26	HPPG-F-045	Total/NA	Solid	ExtChrom	491310
MB 160-491931/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-491931/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	

Eurofins TestAmerica, St. Louis

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

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Job ID: 160-40591-1
SDG: GJ46599745

Rad (Continued)

Prep Batch: 491931 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40591-1 DU	HPPG-317364365-SU28C-001	Total/NA	Solid	ExtChrom	490573

Leach Batch: 491932

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40591-12	HPPG-317364365-SU28C-012	Total/NA	Solid	Dry and Grind	

Prep Batch: 491935

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40591-1	HPPG-317364365-SU28C-001	Total/NA	Solid	ExtChrom	490573
160-40591-11	HPPG-317364365-SU28C-011	Total/NA	Solid	ExtChrom	490606
160-40591-12	HPPG-317364365-SU28C-012	Total/NA	Solid	ExtChrom	491932
160-40591-21	HPPG-317364365-SU28C-021	Total/NA	Solid	ExtChrom	490606
160-40591-26	HPPG-F-045	Total/NA	Solid	ExtChrom	491310
MB 160-491935/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-491935/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	
160-40591-1 DU	HPPG-317364365-SU28C-001	Total/NA	Solid	ExtChrom	490573

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

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Job ID: 160-40591-1
SDG: GJ46599745

Method: 905 - Strontium-90 (GFPC)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Sr (40-110)	Y (40-110)
160-40591-1	HPPG-317364365-SU28C-001	103	91.6
160-40591-11	HPPG-317364365-SU28C-011	96.8	92.7
160-40591-21	HPPG-317364365-SU28C-021	92.9	95.0
LCS 160-490804/1-A	Lab Control Sample	80.9	93.8
LCS 160-491323/1-A	Lab Control Sample	100	99.8
MB 160-490804/22-A	Method Blank	102	92.7
MB 160-491323/23-A	Method Blank	100	92.7

Tracer/Carrier Legend

Sr = Sr Carrier
Y = Y Carrier

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Pu-242 (T) (30-110)	
160-40591-1	HPPG-317364365-SU28C-001	86.9	
160-40591-1 DU	HPPG-317364365-SU28C-001	86.6	
160-40591-11	HPPG-317364365-SU28C-011	91.3	
160-40591-12	HPPG-317364365-SU28C-012	87.0	
160-40591-21	HPPG-317364365-SU28C-021	83.9	
160-40591-26	HPPG-F-045	97.4	
LCS 160-491931/2-A	Lab Control Sample	90.1	
MB 160-491931/1-A	Method Blank	103	

Tracer/Carrier Legend

Pu-242 (T) = Pu-242 (T)

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		U-232 (30-110)	
160-40591-1	HPPG-317364365-SU28C-001	90.0	
160-40591-1 DU	HPPG-317364365-SU28C-001	95.6	
160-40591-11	HPPG-317364365-SU28C-011	85.9	
160-40591-12	HPPG-317364365-SU28C-012	92.8	
160-40591-21	HPPG-317364365-SU28C-021	89.9	
160-40591-26	HPPG-F-045	89.4	
LCS 160-491935/2-A	Lab Control Sample	89.3	
MB 160-491935/1-A	Method Blank	94.3	

Tracer/Carrier Legend

U-232 = Uranium-232

Eurofins TestAmerica, St. Louis



Environment Testing America

ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-40594-1
Laboratory Sample Delivery Group: D1189457
Client Project/Site: HPNS-Parcel G 501197
Revision: 1

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Rose Condit

Rhonda Ridenhower

Authorized for release by:
4/14/2021 2:59:35 PM

Rhonda Ridenhower, Client Service Manager
(314)298-8566
Rhonda.Ridenhower@Eurofinset.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Case Narrative

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

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Job ID: 160-40594-1
SDG: D1189457

Job ID: 160-40594-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-40594-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

The matrix for the Method Blank and LCS is as close to the following samples as can be reasonably achieved. Detailed information can be found in the most current revision of the associated SOP.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Additional information requested in case narrative for total strontium

Case Narrative

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40594-1
SDG: D1189457

Job ID: 160-40594-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

RECEIPT

The samples were received on 11/27/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 15.6 C.

STRONTIUM-90 (GFPC)

Sample HPPG-317364365-SU28C-B-001 (160-40594-1) was analyzed for Strontium-90 (GFPC) in accordance with EPA 905. The samples were dried on 12/01/2020, prepared on 12/09/2020 and analyzed on 12/18/2020.

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP: HPPG-317364365-SU28C-B-001 (160-40594-1).

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC PLUTONIUM (ALPHA SPECTROMETRY)

Sample HPPG-317364365-SU28C-B-001 (160-40594-1) was analyzed for Isotopic Plutonium (Alpha Spectrometry) in accordance with A-01-R. The samples were dried on 12/01/2020, prepared on 12/15/2020 and analyzed on 12/22/2020.

The method blank (MB) Z-score is within limits and is located in the level IV raw data. (MB 160-491931/1-A)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC URANIUM (ALPHA SPECTROMETRY)

Sample HPPG-317364365-SU28C-B-001 (160-40594-1) was analyzed for Isotopic Uranium (Alpha Spectrometry) in accordance with DOE. The samples were dried on 12/01/2020, prepared on 12/15/2020 and analyzed on 12/22/2020.

The method blank (MB) Z-score is within limits and is located in the level IV raw data. (MB 160-491935/1-A)

Detectors 179 and 182 were calibrated on 12/11 therefore no monthly calibration verification (ccv) is needed.(LCS 160-491935/2-A) and (MB 160-491935/1-A)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Sample HPPG-317364365-SU28C-B-001 (160-40594-1) was analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 12/01/2020, prepared on 12/03/2020 and analyzed on 12/24/2020.

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from Reported to Analyte

Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

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Job ID: 160-40594-1
SDG: D1189457

Job ID: 160-40594-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

The replicate precision (RER) for Th-234/U-238 does not meet QC criteria. This appears to be random in nature, and limited deviations such as this are statistically expected when larger analyte lists are reported. Such excursions are often caused by fluctuations in Compton background, force-fitting of peaks that are not found by the software peak-search algorithm, and inclusion of inferior peak results by the software in weighted averages. The laboratory SOP allows for such statistical exceedances.(160-40595-A-5-C DU)

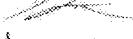
The method blank (MB) z-score associated with Prep Batch 160-490806 is within limits and is stored in the level IV raw data. (MB 160-490806/1-A)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

All Transfers for COC 501197RSY-044

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Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		11/24/2020 16:59	Locked Storage(Kevin Hoch)		11/24/2020 16:59
Locked Storage(Kevin Hoch)		11/25/2020 07:38	Devin Lewis		11/25/2020 07:38
Devin Lewis		11/25/2020 11:08	SHIPPEDTOLAB	 MICHA KORRIN	11/29/2020 09:10


MICHA KORRIN



Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40594-1
SDG Number: D1189457**Login Number:** 40594**List Source:** Eurofins TestAmerica, St. Louis**List Number:** 1**Creator:** Greer, Diane A

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40594-1
SDG: D1189457

Qualifiers

Rad Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
%	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

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Job ID: 160-40594-1
SDG: D1189457

Method	Method Description	Protocol	Laboratory
905	Strontium-90 (GFPC)	EPA	TAL SL
A-01-R	Isotopic Plutonium and Neptunium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Uranium (Alpha Spectrometry)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-7	Preparation, Digestion/Precipitate Separation (7-Day In-Growth)	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy

EPA = US Environmental Protection Agency

None = None

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Eurofins TestAmerica, St. Louis

Sample Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

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Job ID: 160-40594-1
SDG: D1189457

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40594-1	HPPG-317364365-SU28C-B-001	Solid	11/24/20 09:19	11/27/20 09:12	



Eurofins TestAmerica, St. Louis

Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40594-1
SDG: D1189457

Client Sample ID: HPPG-317364365-SU28C-B-001

Lab Sample ID: 160-40594-1

Matrix: Solid

Date Collected: 11/24/20 09:19
Date Received: 11/27/20 09:12

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Strontium-90	-0.0237	U	0.118	0.118	0.331	0.0994	pCi/g	12/09/20 18:42	12/18/20 20:07	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	91.9		40 - 110					12/09/20 18:42	12/18/20 20:07	1
Y Carrier	95.0		40 - 110					12/09/20 18:42	12/18/20 20:07	1

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Plutonium-238	0.00392	U	0.0124	0.0124	0.100	0.00911	pCi/g	12/15/20 12:44	12/22/20 11:15	1
Plutonium-239/240	0.00196	U	0.00877	0.00877	0.100	0.00645	pCi/g	12/15/20 12:44	12/22/20 11:15	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Pu-242 (T)	105		30 - 110					12/15/20 12:44	12/22/20 11:15	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Uranium-234	0.356		0.0527	0.0606	0.250	0.00760	pCi/g	12/15/20 13:10	12/22/20 11:09	1
Uranium-235/236	0.0235		0.0148	0.0150	0.100	0.00546	pCi/g	12/15/20 13:10	12/22/20 11:09	1
Uranium-238	0.303		0.0481	0.0544	0.250	0.00438	pCi/g	12/15/20 13:10	12/22/20 11:09	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	89.0		30 - 110					12/15/20 13:10	12/22/20 11:09	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.509		0.221	0.226		0.164	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Actinium-227	-0.0910	U	0.638	0.638		0.393	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Bismuth-212	-0.338	U	0.884	0.884		0.698	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Bismuth-214	0.458		0.153	0.160		0.0708	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Cesium-137	-0.00127	U	0.0669	0.0669	0.0700	0.0550	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Lead-210	0.615	U	1.70	1.70		1.09	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Lead-212	0.417		0.0947	0.104		0.0452	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Lead-214	0.405		0.106	0.114		0.0639	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Potassium-40	9.69		1.46	1.75		0.128	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Protactinium-231	0.544	U	1.81	1.81		1.98	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Protactinium-234	-0.119	U	0.356	0.357		0.290	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Radium-226	0.458		0.153	0.160	0.200	0.0708	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Radium-228	0.509		0.221	0.226		0.164	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Thallium-208	0.138		0.0547	0.0565		0.0194	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Thorium 228	0.417		0.0947	0.104		0.0452	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Thorium-232	0.509		0.221	0.226		0.164	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Thorium-234	0.197	U	0.223	0.224		0.623	pCi/g	12/03/20 12:24	12/24/20 07:14	1
Uranium-235	0.132	U	0.320	0.320		0.527	pCi/g	12/03/20 12:24	12/24/20 07:14	1

Eurofins TestAmerica, St. Louis

Client Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40594-1
SDG: D1189457

Client Sample ID: HPPG-317364365-SU28C-B-001

Lab Sample ID: 160-40594-1

Date Collected: 11/24/20 09:19

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Uranium-238	0.197	U	0.223	0.224		0.623	pCi/g	12/03/20 12:24	12/24/20 07:14	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

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Job ID: 160-40594-1
SDG: D1189457

Method: 905 - Strontium-90 (GFPC)

Lab Sample ID: MB 160-491323/23-A

Matrix: Solid

Analysis Batch: 492430

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 491323

Analyte	MB	MB	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier								
Strontium-90	0.07392	U	0.140	0.140	0.331	0.108	pCi/g	12/09/20 18:42	12/18/20 20:20	1
Carrier										
Sr Carrier										
Y Carrier										

Lab Sample ID: LCS 160-491323/1-A

Matrix: Solid

Analysis Batch: 492430

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 491323

Analyte	MB	MB	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec.	Limits
	Result	Qualifier									
Strontium-90			7.76	5.897		0.638	0.331	0.109	pCi/g	76	75 - 125
Carrier											
Sr Carrier											
Y Carrier											

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Lab Sample ID: MB 160-491935/1-A

Matrix: Solid

Analysis Batch: 492942

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 491935

Analyte	MB	MB	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier								
Uranium-234	0.02388		0.0168	0.0170	0.250	0.00855	pCi/g	12/15/20 13:10	12/22/20 16:24	1
Uranium-235/236	0.0000	U	0.00914	0.00914	0.100	0.00752	pCi/g	12/15/20 13:10	12/22/20 16:24	1
Uranium-238	0.003666	U	0.00733	0.00734	0.250	0.00426	pCi/g	12/15/20 13:10	12/22/20 16:24	1
Tracer										
Uranium-232										

Lab Sample ID: LCS 160-491935/2-A

Matrix: Solid

Analysis Batch: 492945

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 491935

Analyte	MB	MB	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec.	Limits
	Result	Qualifier									
Uranium-234			3.18	2.903		0.286	0.250	0.0116	pCi/g	91	84 - 120
Uranium-238			3.26	2.976		0.291	0.250	0.00437	pCi/g	91	82 - 122
Tracer											
Uranium-232											

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QC Sample Results

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 Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

 Job ID: 160-40594-1
 SDG: D1189457

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Lab Sample ID: MB 160-491931/1-A

Client Sample ID: Method Blank

Matrix: Solid

Prep Type: Total/NA

Analysis Batch: 492849

Prep Batch: 491931

Analyte	Result	MB	MB	Count	Total	DLC	Unit	Prepared	Analyzed	Dil Fac
				Uncert.	(2σ+/-)					
Plutonium-238	-0.005773	U		0.00861	0.00862	0.100	0.00895	pCi/g	12/15/20 12:44	12/22/20 11:15
Plutonium-239/240	-0.001926	U		0.00861	0.00862	0.100	0.00776	pCi/g	12/15/20 12:44	12/22/20 11:15
Tracer		MB	MB							
Pu-242 (T)	103	%Yield	Qualifier	Limits						
		30 - 110								

Lab Sample ID: LCS 160-491931/2-A

Client Sample ID: Lab Control Sample

Matrix: Solid

Prep Type: Total/NA

Analysis Batch: 492847

Prep Batch: 491931

Analyte	Spike Added	LCS Result	LCS Qual	Count	Total	DLC	Unit	%Rec	%Rec. Limits
				Uncert.	(2σ+/-)				
Plutonium-238	2.61	2.812		0.279	0.100	0.0120	pCi/g	108	80 - 125
Plutonium-239/2	2.64	2.642		0.265	0.100	0.00909	pCi/g	100	81 - 125
40									
Tracer		LCS	LCS						
Pu-242 (T)	90.1	%Yield	Qualifier	Limits					
		30 - 110							

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-490806/1-A

Client Sample ID: Method Blank

Matrix: Solid

Prep Type: Total/NA

Analysis Batch: 492974

Prep Batch: 490806

Analyte	Result	MB	MB	Count	Total	DLC	Unit	Prepared	Analyzed	Dil Fac	
				Uncert.	(2σ+/-)						
Actinium 228	0.05721	U		0.116	0.116	0.0625	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Actinium-227	0.04285	U		0.0714	0.0716	0.259	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Bismuth-212	-0.006457	U		0.333	0.333	0.273	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Bismuth-214	0.001033	U		0.000924	0.000930	0.141	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Cesium-137	0.01744	U		0.0296	0.0297	0.0700	0.0211	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Lead-210	0.4198	U		0.929	0.931	0.732	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Lead-212	0.0009085	U		0.0512	0.0512	0.0416	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Lead-214	-0.02615	U		0.0747	0.0747	0.0630	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Potassium-40	0.3313			0.250	0.253	0.110	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Protactinium-231	0.0000	U		0.460	0.460	1.72	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Protactinium-234	0.03941	U		0.0812	0.0813	0.148	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Radium-226	0.001033	U		0.000924	0.000930	0.200	0.141	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Radium-228	0.05721	U		0.116	0.116	0.0625	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Thallium-208	-0.03518	U		0.0689	0.0690	0.0361	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Thorium 228	0.0009085	U		0.0512	0.0512	0.0416	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Thorium-232	0.05721	U		0.116	0.116	0.0625	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Thorium-234	0.0000	U		0.109	0.109	0.573	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Uranium-235	0.0000	U		0.112	0.112	0.240	pCi/g	12/03/20 12:24	12/24/20 05:52	1	
Uranium-238	0.0000	U		0.109	0.109	0.573	pCi/g	12/03/20 12:24	12/24/20 05:52	1	

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QC Sample Results

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40594-1
SDG: D1189457

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-490806/2-A

Client Sample ID: Lab Control Sample

Matrix: Solid

Prep Type: Total/NA

Analysis Batch: 492975

Prep Batch: 490806

Analyte	Spike Added	LCS		Total		DLC	Unit	%Rec	%Rec. Limits
		Result	Qual	Uncert. (2σ+/-)	LOQ				
Americium-241	96.4	102.3		10.7		0.361	pCi/g	106	87 - 116
Cesium-137	26.7	26.88		2.90	0.0700	0.0857	pCi/g	101	87 - 120
Cobalt-60	9.43	9.636		1.04		0.0186	pCi/g	102	87 - 115

Eurofins TestAmerica, St. Louis

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

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Job ID: 160-40594-1
SDG: D1189457

Rad

Leach Batch: 490609

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40594-1	HPPG-317364365-SU28C-B-001	Total/NA	Solid	Dry and Grind	

Prep Batch: 490806

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40594-1	HPPG-317364365-SU28C-B-001	Total/NA	Solid	Fill_Geo-21	490609
MB 160-490806/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490806/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 491323

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40594-1	HPPG-317364365-SU28C-B-001	Total/NA	Solid	DPS-7	490609
MB 160-491323/23-A	Method Blank	Total/NA	Solid	DPS-7	
LCS 160-491323/1-A	Lab Control Sample	Total/NA	Solid	DPS-7	

Prep Batch: 491931

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40594-1	HPPG-317364365-SU28C-B-001	Total/NA	Solid	ExtChrom	490609
MB 160-491931/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-491931/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	

Prep Batch: 491935

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40594-1	HPPG-317364365-SU28C-B-001	Total/NA	Solid	ExtChrom	490609
MB 160-491935/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-491935/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	

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Tracer/Carrier Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

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Job ID: 160-40594-1
SDG: D1189457

Method: 905 - Strontium-90 (GFPC)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Sr (40-110)	Y (40-110)
160-40594-1	HPPG-317364365-SU28C-B-00	91.9	95.0
LCS 160-491323/1-A	Lab Control Sample	100	99.8
MB 160-491323/23-A	Method Blank	100	92.7

Tracer/Carrier Legend

Sr = Sr Carrier
Y = Y Carrier

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Pu-242 (T) (30-110)	
160-40594-1	HPPG-317364365-SU28C-B-00	105	
LCS 160-491931/2-A	Lab Control Sample	90.1	
MB 160-491931/1-A	Method Blank	103	

Tracer/Carrier Legend

Pu-242 (T) = Pu-242 (T)

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		U-232 (30-110)	
160-40594-1	HPPG-317364365-SU28C-B-00	89.0	
LCS 160-491935/2-A	Lab Control Sample	89.3	
MB 160-491935/1-A	Method Blank	94.3	

Tracer/Carrier Legend

U-232 = Uranium-232

Eurofins TestAmerica, St. Louis

Engel, Audrey

From: Engel, Audrey
Sent: Wednesday, December 9, 2020 10:59 AM
To: Ridenhower, Rhonda
Cc: Condit, Rose
Subject: Adding analyses to 40591

Hi Rhonda, please add Uranium and Plutonium analysis to samples 40591-12 and 40591-26. Thanks,

Audrey Engel

Chemist

M 916 317 5546

E audrey.engel@aptim.com



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